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NUMBER 80

SEPTEMBER 1944

THE BULLETIN

OF THE

U. S. Army Medical Department

**A periodical containing original articles, reviews, news, and
abstracts of interest to the Medical Department of the Army**

**ISSUED UNDER THE AUSPICES OF
THE OFFICE OF THE SURGEON GENERAL**

**PUBLISHED MONTHLY AT THE MEDICAL FIELD SERVICE SCHOOL,
CARLISLE BARRACKS, PENNSYLVANIA**

By direction of the Secretary of War, the material contained herein is published as administrative information for the proper transaction of the public business and with the approval of the Director of the Budget.

**NORMAN T. KIRK
Major General, U. S. Army,
The Surgeon General.**

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WAR DEPARTMENT
OFFICE OF THE SURGEON GENERAL,
WASHINGTON 25, D. C.

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Foreword

With the October 1943 issue, The Bulletin became a monthly periodical, instead of a quarterly, dedicated to keeping the personnel of the Medical Department informed on developments in war medicine. The new publication, known as The Bulletin of the U. S. Army Medical Department, absorbed the former quarterly dental and veterinary bulletins and will have material devoted to those fields in each issue.

The Bulletin is intended to be educational rather than directive in nature. It will contain the best information obtainable concerning military medical experience, observations, and procedure that may help to improve further the quality of professional services. The Bulletin will be a medium whereby experience gained in one theater of combat may be shared with those serving in other combat areas and with those in this country who are preparing for overseas duty. News items concerning military and scientific developments as well as original articles will be emphasized. The Bulletin, however, should not serve as a basis for the forwarding of requisitions for equipment or supplies referred to therein.

Obviously, some of the most interesting field experiences cannot be divulged in a periodical of this kind when our country is at war. The Bulletin will, however, publish that which can be safely told, drawing not only on current literature, but on many authoritative reports which reach The Surgeon General's Office from the field. Officers are invited to submit for publication reports of their field experiences that can profitably be shared with other officers.

The Medical Department has been commended for its work in caring for the sick and wounded in theaters of operations in war. The Bulletin will endeavor to stimulate such progress and to advance further the high standard of medical service in the Army of the United States.

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Notice to Contributors

Contributions to The Bulletin should be typewritten, double spaced, with wide margins, and in duplicate including the original and one carbon copy. Great accuracy and completeness should be used in all references to literature, including the name of the author, title of article, name of periodical, with volume, page, and number—day of month if weekly—and year. Materials supplied for illustrations, if not original, should be accompanied by reference to the source and a statement as to whether or not reproduction has been authorized. Adequate legends should accompany each illustration in order to point out clearly to the reader the condition or lesion or other objectives, which in some instances should be indicated by a small arrow or other device. Each illustration and table should bear the author's name on the back; photographs should be clear and distinct; drawings should be made in black ink on white paper. Original articles will be accepted for publication on condition that they are contributed solely to The Bulletin and that editorial privilege is granted in preparing the material submitted for publication. Reprints may be ordered for official use. Arrangements for reprints for personal use may be made direct with the Book Shop, Medical Field Service School, Carlisle Barracks, Pennsylvania. The type will be held for two months following publication.

News and Comment

PREVENTION AND TREATMENT OF MUSTARD BURNS

When liquid mustard comes in contact with any part of the body, personal decontamination must be accomplished at the earliest possible moment, preferably within the first minute. Personal decontamination is an individual responsibility except for patients who are unable to carry out this procedure. After liquid mustard has remained on hot, sweaty skin for three minutes or on cool, dry skin for five minutes, no method of decontamination will prevent blistering. Any mustard erythema which requires therapy may be treated symptomatically, using calamine lotion for the mild cases and amyl salicylate for severe cases. Large blisters which are tense and painful should be punctured and drained using sterile technique. Small blisters should be left intact and covered with a dry dressing. Persistent pain and itching may be relieved by amyl salicylate dressings. Amyl salicylate should not be used on the face or genitalia. Blistered areas which have become denuded are treated like thermal burns, pressure dressings with petrolatum or boric acid treatment being the method of choice. The dressings are changed infrequently (ten to fourteen days) using sterile technique.

Infection is best prevented or treated by the oral administration of a sulfonamide, preferably sulfadiazine under the supervision of a medical officer. Liquid mustard eye contaminations should be washed out immediately with copious amounts of water, using at least one canteenful. Corneal damage may be diagnosed by placing a fluorescein tablet in the lower conjunctival sac. Damage will be indicated by a yellow-green staining of the cornea. When corneal damage is apparent, immediate steps must be taken to produce mydriasis by the instillation of either an atropine ophthalmic disk or a 1 percent solution of atropine. When eyes become secondarily infected, secretions must be removed gently by minimal irrigation with 1 percent saline. The infection is best controlled by filling the eye with a 10 percent solution of sodium sulamyd every two hours. A sulfonamide ophthalmic ointment every four hours may be substituted for the sodium sulamyd. Petrolatum should be applied to the lid margins if they tend to stick together.

CLINICAL STUDY OF EXPOSURE TO CHLORINE

Cylinders containing chlorine were being transported on a truck through Brooklyn last June, when one cylinder was discovered to be leaking. The driver stopped near the entrance to an air vent for a subway, and because of the tendency of chlorine to seek low levels, it accumulated in the subway. Four hundred and eighteen persons exposed to chlorine gas were examined, of whom 208 were admitted to hospitals and 133 studied by Army personnel. There were no fatal casualties. Thirty-three persons were hospitalized from one to two weeks under special observation for symptomatology, pathology, clinical course, and the evaluation of therapy.

The significant pulmonary changes were pulmonary edema, tracheobronchitis, and pneumonia. Pulmonary edema, chiefly at the base of the lungs, was observed in 23 of 30 patients; the remaining 3 among the 33 patients under special observation were not observed in the early postexposure period and no statement concerning pulmonary edema in them can be made. Tracheobronchitis occurred in all 33 patients, the signs and symptoms usually becoming evident within twenty-four to forty-eight hours and subsiding in most instances in five to seven days. Obstructive emphysema occurred in 4. Of the 14 who developed pneumonia, 12 had pulmonary edema. Except for 3 patients, the clinical course of the pneumonia was relatively benign. Injury to the eye and upper respiratory tract was of minimal degree and short duration.

Oxygen was given to all acutely ill patients and the arterial saturation was increased to normal in all who had shown unsaturation. Twenty-two patients received penicillin or sulfadiazine from the first day after exposure and 11 received no specific prophylactic therapy for pneumonia. The incidence of pneumonia in the specifically treated group was 32 percent and in the untreated group 64 percent. While the number of patients is too small to allow definite conclusions, it appears that sulfadiazine and penicillin were prophylactically of value against pneumonia. Conclusion cannot be drawn at this time on the relative values of penicillin and sulfadiazine.

Bronchodilating drugs, such as adrenalin and aminophylline, when given early, were of benefit in relieving respiratory distress and bronchial obstruction, but when given late, they were of no value.

DELAY ADVISED IN TREATMENT OF ANEURYSM

Multiple injuries are more frequent in this war than ever before. For this reason, the chances of vascular injury are greatly increased. Small arterial false aneurysms, and particularly arteriovenous communications, are frequently overlooked; the importance of careful palpation and auscultation of every wound are therefore important.

Operation for the extirpation of an aneurysm or an arteriovenous fistula is rarely a procedure requiring emergency treatment. Since wounds causing aneurysms may be infected, and since extravasation of blood into the tissues surrounding the wound usually occurs, delay in operation will diminish the chance of secondary infection and secondary hemorrhage. Moreover, *operation should be postponed until such time as collateral circulation has been established, so that major vessels may be safely ligated and divided.* This will usually require three or four months. The only exception calling for early operation is a rapid increase in the size of an aneurysmal tumor indicating impending rupture. In such cases, repeated sympathetic block using 1 percent procaine hydrochloride solution (or sympathectomy, if indicated) should be done both pre- and postoperatively to assure maximum vasodilatation and thus increase circulation in the involved part. Overseas patients with aneurysms should be evacuated to the zone of the interior, where, upon arrival, they should be sent to vascular surgery centers in accordance with paragraphs 1k and 3c, W.D. Circular No. 140, dated 11 April 1944, and W.D. Circular No. 235, dated 12 June 1944.

FALSE POSITIVE SEROLOGY IN INFECTIOUS HEPATITIS

In a study of 63 cases of infectious hepatitis among allied military personnel in Sicily by Captain William C. Kuzell, M.C., and Vittorio Puccinelli, M.D., of the University of Palermo, 15 cases showed false positive or doubtful positive serologic reactions after the clinical appearance of jaundice. The serologic studies in this series were not made prior to the onset of jaundice. This places infectious hepatitis, the authors say, in the group with yaws, leprosy, infectious mononucleosis, and some other diseases as one of the principal causes of false positive serology. In 8 or 9 positive cases when both the Kahn and Wassermann tests were performed, the Kahn test was more strongly positive and remained so for a longer time.

In a study of 20 cases showing false positives there was a pronounced trend toward negativity in the third week after icterus appeared; only 7 remained positive after the third week; and only one case was faintly positive in the seventh week.

**DISCONTINUANCE OF THERAPEUTIC ANTIPNEUMOCOCCIC
AND ANTIMENINGOCOCCIC SERA**

When the present supply of antisera for the treatment of pneumococcic and meningococcic infections is exhausted, these items will no longer be furnished. In view of the high effectiveness of sulfonamide drugs and penicillin in treating such infections, these antisera are no longer needed for therapeutic use. Typing antisera are being continued. The use of anti-pneumococcic typing sera adds to the accuracy in diagnosis of bacterial pneumonia, particularly in differentiation of streptococci and pneumococci in the sputum. It is important that availability of highly potent chemotherapeutic agents should not lead to lower standards of diagnosis. Sulfadiazine is still the drug of first choice for treating meningococcic and pneumococcic infections. In severe or complicated pneumococcic infections, penicillin should be used from the beginning. Sulfadiazine has advantages over penicillin for routine treatment of meningococcic infections. Sulfa-resistant strains of meningococci are extremely rare. In treatment of meningitis, penicillin must always be administered both intrathecally and parenterally (Technical Bulletin TB MED 9, 12 February 1944).

In treatment of shock in fulminating meningococcemia, use of antiserum for its content of antitoxin apparently is of little importance if shock is adequately treated according to sound physiologic principles.

DANGERS FROM THE ADMINISTRATION OF DORYL

Attention has previously been called¹ to fatalities which have resulted from the therapeutic use of Doryl powder. Investigations reveal that, since the first recorded fatality in 1940, fifteen deaths from this cause have been reported, the last one in April 1944.

Doryl (carbaminoylcholine chloride) is marketed in two ways: (1) A solution in ampules containing 0.25 mg. (1/260 grain) in 1 cc. water to be injected hypodermically for the relief of retention of urine. (2) A powder in ampules containing 150 milligrams (2 1/3 grains) to be dissolved in water and used as eye drops for ophthalmologic purposes.

The labeling used on the Doryl powder apparently was not sufficiently clear or comprehensive for the appropriate and safe use of this drug which, it is understood, is also known as Carbamylcholine Chloride and as Lentin.

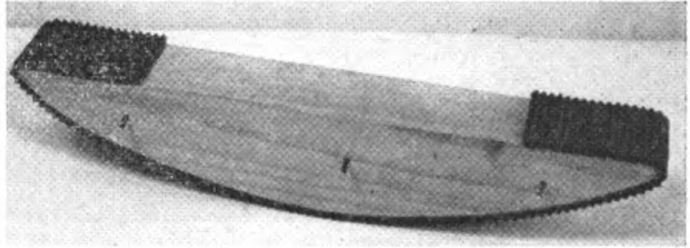
While the manufacturers have asked for the return of all Doryl shipped prior to 1 October 1943 and have drastically altered the appearance and type of container as well as the label of Doryl powder, the possibility remains that isolated ampules containing this product may have been purchased as a non-standard item by a few Army medical installations and may still be in their possession.

1. J.A.M.A., 123:1051, 18 December 1943.

Medical installations of the Army have been directed to take immediate steps to dispose of all supplies of Doryl or carbaminoylcholine chloride by whatever name, which may be in their possession, and all necessary precautions will be taken to preclude its use in the future.

MODIFICATION OF THE TELSON ROCKER

Various mechanisms have been designed to allow weight bearing while in plaster. The U-shaped walking iron and wooden heels have the disadvantage of throwing the foot into eversion and the leg in a position for a rotary swinging gait. The rocker type allows a straight step with the foot in a neutral position and more nearly approximates a normal gait. The rocker originated by D. R. Telson is one of the most satisfactory of this type. The proper gage of strap steel being not available, Captain Newton C. McCullough, M. C., reports experiments at Rhoads General Hospital with a wooden modification of the Telson rocker, weighing only 5½ ounces instead of 24 ounces which the steel model weighs, and it is cheaper and easier to make.



Instead of passing the plaster through the walker as is done on the metal type, three nails driven into each side of the wooden rocker tie it in with the plaster bandage. The rubber tread is corrugated and is nailed at the ends and glued throughout. The posterior aspect of the rocker should be well beneath the heel. The plaster bandage is rolled over the rubber tread and about the nails and wears off in about two or three days, exposing the rubber surface.



More recently the arc of the rocker was changed so the posterior half has a shorter radius than the anterior half. This results in a bulge presenting itself under the weight-bearing

line of the heel and seems to make the rocker more efficient and comfortable, but this change has not been used in enough cases to be sure of its advantage. The wooden rocker is made of white pine lumber. An attempt was made to avoid tacking the rubber, but glue alone was not sufficient to hold it. Damage to flooring has been avoided by placing the tacks at the ends and on the top. The rocker is $1\frac{5}{8}$ inches wide and 10 inches long.

DIET AND FATIGUE IN HOT CLIMATES*

Vitamin requirements for adult men probably do not differ in hot climates from those in temperate zones. Niacin may be an exception. Sweat losses of vitamins, with the possible exception of niacin, are insignificant. This is true even at the highest rates of sweating.

Heat exhaustion is primarily referable to the cardiovascular system and is promoted by all conditions which interfere with or place strain on this system. High temperature greatly increases the strain on the cardiovascular system, and this may be estimated for certain purposes by the use of postural tests like the Crampton "blood ptosis" tests. Inadequate salt intake in the heat promotes heat exhaustion but does not necessarily lead to heat cramps. A total salt intake of 2 grams of sodium chloride for every liter of sweat formed is adequate. An intake of salt above adequacy does not provide any benefit in high temperatures. Anorexia is an important warning of impending heat exhaustion. Plain salt tablets should be avoided in the heat where possible. If food is eaten and table salt is available, the appetite will provide for proper salt intake.

Acclimatization to heat is a rapid process in young men and is largely accomplished in three or four days of hard work in the heat. Acclimatization to heat gained in two days of work at a high temperature is significantly persistent for several weeks, but not more than a month.

"Nonperishable" foods stored at temperatures of the order of 100° F. for several months lose an important portion of the contained thiamine and much smaller amounts of riboflavin and nicotinic acid. These losses are most prominent in processed meats and canned vegetables. The functional activity of the gastro-intestinal tract is ordinarily increased, or at least not diminished, at high temperatures.

*Abstract of Medical Nutrition Report No. 13 to the Committee on Medical Research of the Office of Scientific Research and Development, based on work by Ancel Keys at the University of Minnesota.

EASILY TRANSPORTED TOILET SEATS

Many individuals suffer under field conditions when toilet seats are not available. The latrine box is adequate but very bulky and, unless readily disassembled, its use is limited when transportation is restricted. Colonel Charles C. Gill, M. C., reports that the individual, portable seat, illustrated here and designed for use in the field, requires a minimum of space for its transportation. This device is constructed of plywood with a standard-size hole. The material removed when the hole is cut is saved and attached to the lightweight top cover



FIGURE 1. Top and side view of the seat. The thickness of a complete unit is $1\frac{1}{2}$ inches. Paint is necessary to prevent the material from warping. Signal Corps photograph.



FIGURE 2

to strengthen the cover and to help prevent warpage. Installation of this apparatus is simple. The individual latrine pit is dug. Earth is put around the pit and firmly tamped in place. The latrine seat is placed on top of the slight elevation and adjusted to be flyproof. A small amount of dirt dug away from the front of the seat forms a depression for the feet and places

the body in the traditional posture. This toilet seat, which has been successfully used on field problems, serves the purpose of the latrine box and is a marked saving of space in trucks used for transporting equipment for sanitation purposes.

SPECIALLY TRAINED PSYCHIATRISTS

A class of 140 medical officers who were given special training in three schools of military neuropsychiatry in the New York area graduated on 7 July and were ordered to duty in Army general hospitals to aid in treatment of psychiatric cases. Most of the officers recently completed nine-month internships followed by special courses at the Army Medical Field Service School, Carlisle Barracks, Pennsylvania, and in general hospitals throughout the country. They then entered the schools of military neuropsychiatry for three months' intensive study. Classes were conducted at the Mason General Hospital on Long Island, the Columbia University College of Physicians and Surgeons, and Bellevue Hospital under the direction of leading civil and military psychiatrists and neurologists.

A new class of 70 officers entered at Mason on 8 July. The courses at Columbia and Bellevue will be discontinued temporarily. Director of the school at Mason General Hospital is Colonel William C. Porter, Medical Corps. The course at Columbia was under the direction of Dr. Nolin D. C. Lewis, director of the New York Psychiatry Institute, and Dr. Tracy Putnam, director of the New York Neurological Institute. Dr. S. Bernard Wortis, chief psychiatrist at Bellevue Hospital was director of the school there. Medical officers returning from overseas and leading psychiatrists in civilian practice served as special lecturers.



First-aid men returning from front lines with soldier wounded on Anzio beachhead in Italy, 23 May 1944. Signal Corps photograph.

PATIENTS EVACUATED TO ZONE OF THE INTERIOR

The Office of The Surgeon General receives reports from port surgeons at ports of debarkation as to the number of evacuees arriving in the United States and details of individual cases are obtained later from the Sick and Wounded reports.

A review of individual Sick and Wounded reports for more than 36,000 evacuees shows that the primary cause of evacuation in over 80 percent of the cases was disease. Battle casualties and injuries other than battle casualties each accounted for less than 10 percent of all evacuees. The airplane was used as the means of transportation in only about one out of every eleven cases arriving in the United States. Relatively few battle casualties reached this country by plane.

Differences in evacuation policies and in health conditions in the theaters obviously result in differences in the number of men evacuated per 1,000 strength. Thus, because of its evacuation policy and relatively high morbidity from disease, the South Pacific has evacuated men at a considerably higher rate than other theaters. Because of the very favorable health conditions in the Central Pacific, the rate of evacuation has been very low. Until the invasion of Normandy, the North African Theater, which includes Sicily and Italy, was the only theater where sizable combat operations had been practically continuous for a considerable period. For that reason the number of men evacuated per 1,000 strength on account of battle casualty was substantially greater than for other theaters. The North African Theater also showed a much higher rate of evacuation than other theaters for nonbattle injuries.

If allowance is made for the effects of evacuation policy, significant differences between theaters in the rate of evacuation for individual causes become apparent. Thus, it becomes clear that the rate of evacuation for psychoneurosis has been highest from theaters (such as the North African, South Pacific, and Southwest Pacific Theaters) in which combat action has taken place. However, with increasing knowledge of this problem the number of cases of psychoneurosis has decreased in recent months. Differences between the theaters in regard to patients evacuated for psychosis have not been very large.

In relation to the strength of the armed forces, the largest proportion of men evacuated for musculoskeletal conditions were from the South Pacific, and the lowest from the Central Pacific. Relatively little difference has prevailed in the proportion of men evacuated for arthritis, but the North African and South Pacific Theaters appear to have been above average.

Little variation has shown up in the rates of evacuation for tuberculosis and peptic ulcers. The highest rates for tuberculosis were indicated from the Middle East, and for peptic ulcers from China-Burma-India.

SKIN DISEASES IN THE TROPICS

The Office of the Chief Surgeon, Southwest Pacific Area, has reported that skin diseases are an important factor in non-effective rates in the forward areas and that about 7 percent of hospital admissions and 4 percent of patients evacuated to the United States are due to such diseases. Many dispensaries are said to show as high as 75 percent of those reporting to sick call suffering from skin diseases which, in general, are the same as those seen in temperate climates, but because of climatic conditions they take on different characteristics and frequently are more severe. Yaws and *tinea imbricata* have not been observed.

Until recently, qualified dermatologists were not stationed in the forward area, but this situation has been improved. It has been noted that the successful treatment of skin diseases in the tropics differs from that in temperate climates. The most common mistake, the report states, has been overtreatment. The drugs most often misused have been salicylic acid, iodine, and the sulfonamides. Ointments, pastes, and occlusives have to be used with extreme care because they are likely to produce maceration. Self-treatment with the fungicidal solution (Frazier's Solution) supplied in the jungle kit has been responsible for much overtreatment.

The most common dermatoses observed are fungous diseases. Dermatophytoses of the feet and hands show a greater tendency to become eczematized than in temperate climates, especially when overtreated. Vesicular dermatoses of the hands such as pompholyx, dermatophytides, and contact dermatitis are often misdiagnosed as fungous diseases and treated with fungicidal agents, resulting in eczematous conditions. Other common fungous diseases are *tinea circinata*, *tinea cruris*, and *tinea versicolor*. Impetigo bullosa involving the axilla and groins is extremely common in all dispensaries. Impetigo of the bearded region is rare. Ecthymatous ulcers following abrasions, scratches, insect bites, and other superficial injuries account for many hospitalizations. Tropical ulcers of the phagedenic type have not been observed in troops.

Dermatitis venenata is less commonly seen among troops of this area than in the United States. The condition occurs only rarely from sensitization to foliage but does occur from contact with saps of two of the common trees. Contact dermatitis from the local application of the sulfonamide drugs is fairly frequent.

Eczema of hands and feet, infectious eczematoid dermatitis, atopic dermatitis, and other eczematoid conditions are apparently always aggravated by the tropical conditions and more care should be exercised in overseas physical examination to prevent individuals with these conditions being sent to the tropics. Other chronic conditions which usually become aggravated are psoriasis, acne, and furunculosis. Miliaria or heat rash is extremely common and accounts for a large per-

centage of the cases seen in dispensaries. Cases of scabies, pediculosis corporis or pediculosis pubis are rarely seen. The report states that an unexpected observation has been the relatively large number of peculiar cases of lichen planus hypertrophicus. In three months 28 cases of this condition were observed by the dermatologic consultant in the forward area. These cases present a uniform clinical picture. The condition develops suddenly and progresses rapidly. The lips and buccal membrane usually show marked involvement. The process consists of raised hypertrophic patches covering large areas of the trunk and limbs and is usually very symmetrical. Biopsy examinations have revealed the characteristic histologic picture of lichen planus. The common type of lichen planus as seen in temperate climates has been observed in only two cases.

SUBSTITUTE FOR LINGUAL GOLD BARS

A new technique in the fabrication of lower partial dentures was developed in the prosthetic laboratory of the 200th Station Hospital by Major Julian M. Rieser, D.C., and Technician Anthony J. Fornaro.

The shortage of prefabricated lingual gold bars demanded a modification in technique and a substitute. It was found that galvanized iron wire could be soldered with gold solder; it was tough and rigid and could be covered satisfactorily with acrylic.

The impressions of the mouth are taken in the usual way, and the case is designed for clasps or other attachments as in any other acceptable technique for a partial denture. A suitable length of 14-gage galvanized iron wire is cut to the approximate length of a lingual bar, including added length to serve as a retention loop in the saddle areas. The ordinary round wire is cut into a half-round thickness with a stone or disk, and it is then adapted to the lingual with pliers. The bar (wire) is then removed from the model and three thicknesses of ordinary adhesive tape are applied to the lingual area. The bar (wire) is readapted and held in place with sticky wax. Gold wire clasps and rests are then constructed for the abutment teeth, and the clasps are soldered to the galvanized iron wire. The teeth are set up and the case, including lingual (wire) bar, is waxed. The tissue side of the bar also receives a thickness of wax, and this thickness is determined by removing the adhesive tape.

The completed case will have about one-half millimeter of acrylic about the galvanized lingual bar. The bar will not be acted on by saliva; it is rigid, strong, and satisfies the prerequisites expected of a gold lingual bar.

From the Dental Division of The Surgeon General's Office.

BODY ARMOR

In a letter to Major General Norman T. Kirk, The Surgeon General, Brigadier General M. C. Grow, Surgeon, A.A.F. Headquarters in England, reported that 97 instances were on record in that office up to 1 April 1944 in which individuals wearing body armor were struck by enemy missile in the area covered by the armor. Of these, 69 percent were uninjured, 22 percent slightly injured, 7 percent killed, and 2 percent seriously injured.

An officer on a mission over enemy territory was serving as navigator when a fragment of flak entered the aircraft striking the officer's helmet squarely in front with sufficient force to knock him back 6 feet. His helmet, the plastic liner, and the wool-lined leather helmet were pierced but only a minor laceration of the scalp was inflicted. The victim spoke of the incident as follows: A steel helmet is a cumbersome piece of equipment. But, some instinct impelled me to always take mine along. Much of the time it was kicked



FIGURE 1

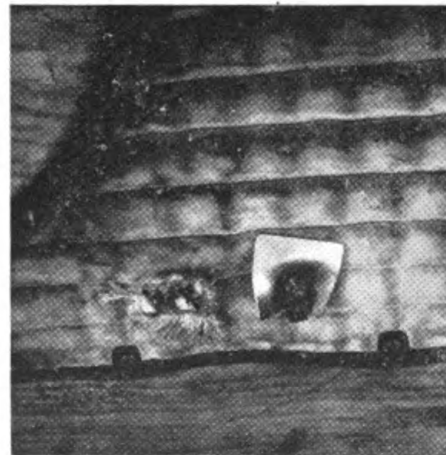


FIGURE 2

around and stumbled over in the nose of the "Fort" which I was assigned to navigate. Several times when black puffs were in the immediate vicinity, I would reach for the helmet and drop it onto my head until we were out in the clear again. Finally the day came when that habit paid dividends. Over Frankfurt, the ack-ack seemed to have us bracketed and I dropped the "Tin Kelly" over my head. About 30 seconds later flak came in from the nose of the ship. One piece made a direct hit on the helmet, going through it and the liner and making only a scratch on my scalp. The news of the incident spread over our particular field and men started digging into their belongings and dusting off their tin hats. Now we look like an infantry outfit. How about you? Is your head tougher than a steel helmet?

Another officer, an observer, was standing in the radio compartment of a B-24-J airplane watching the bombing results of another group. A burst of flak entered the aircraft and hit him in the lower abdomen passing through a flak suit, an electric heated suit, a "Mae West," and his trousers, stopping on the

outside of his undershirt and knocking him to the floor. The piece of flak was jagged, rough, and $1\frac{1}{2}$ inches long. The squadron surgeon reported that only a hematoma 2 inches square was present in the abdominal wall and that, no doubt, the flak suit saved this officer's life.

An officer on a mission over enemy territory, during a head-on attack by enemy fighters, was struck by a machine-gun bullet which perforated the flak suit and penetrated the lower abdominal cavity causing extensive visceral damage. This officer was killed.

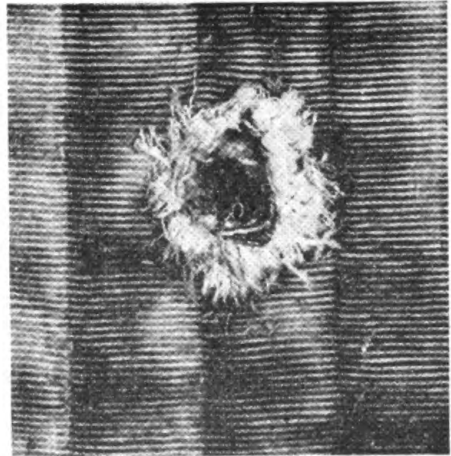


FIGURE 3

COURSE FOR TRAINING TECHNICIANS IN MAINTENANCE OF EQUIPMENT

A recent survey by the maintenance branch of the Supply Service of The Surgeon General's Office indicates that some station and general hospitals are without adequate maintenance service for the expensive and elaborate medical equipment at these installations. This maintenance service can be provided through enlisted personnel who have completed the medical equipment maintenance technician's course in the Medical Supply Services School, St. Louis, Missouri, where classes enter every other month. The prerequisite includes basic military training and a high school education. The course includes didactic instruction and practical training in the installation, maintenance, and repair of x-ray, fluoroscopies, and operating-room equipment, sterilizers, gas anesthesia equipment, resuscitators, oxygen-therapy equipment, electro-medical equipment, and other miscellaneous equipment of the Medical Department.

Request for the allotment of quotas to this course of training should be made in accordance with A.S.F. Circular No. 87, 23 September 1943, and subsequent amendments thereto.

PREVENTION OF FOGGING OF GLASSES

A suggestion has been received from the 29th General Hospital that fogging of glasses while wearing operating-room masks may be prevented by using the gas mask anti-dim cloth according to instructions on the container. This should not be employed as a routine procedure since basis of issue for the anti-dim cloth does not contemplate such use, but it may prove of great assistance under conditions where fogging of glasses is very severe.

THE TRAINING OF DENTAL OFFICERS

Prior to the declaration of war and in the two years following it, many reserve officers received special instruction in Army general hospitals. More than 600 reserve dental officers had received formal instruction in oral surgery, prosthetics, and clinic management by 1 January 1942. There have also been Dental Corps internships, courses in maxillofacial plastic surgery, and courses at the Medical Field Service School, Carlisle Barracks, Pennsylvania.

Internships. A system of Dental Corps internships was authorized by the War Department in 1939. Eight interns were selected beginning 1 July of that year to serve for twelve months as employees of the Government in a civil capacity, receiving quarters, subsistence, and a salary of \$60 per month, preparatory for appointment in the Regular Army. The dental graduates selected for these internships received a year's postgraduate experience and instruction in oral surgery, prosthetics, and operative dentistry. To date, 47 interns have completed the year's work in the five designated Army general hospitals. These internships terminated 1 July 1943 for the duration.

Maxillofacial and plastic surgery courses. A total of 262 dental officers was afforded training varying from four to twelve weeks in maxillofacial and plastic surgery in seven different institutions. These courses were suspended late in 1943. Although no formal courses are being given now, hundreds of dental officers are gaining experience in the oral surgery, prosthetic, and operative sections in many dental installations in this country and overseas.

Medical field training. Colonel Neal A. Harper, D. C., director, Department of Dental Field Service, Medical Field Service School, Carlisle Barracks, reports that the Dental Corps has been represented at the Medical Field Service School in both faculty and student body since it was established in 1921, and that until 1 July 1944 a total of 3,797 dental officers had been issued certificates of graduation; an additional 169, for one reason or another, did not complete the course or graduate.

Twenty-two of the 272 total hours of instruction at Carlisle Barracks are devoted exclusively to dental subjects. The course given by the Department of Dental Field Service is devoted to organization, functions, and administration of the Dental Corps. It includes missions, duties of dental officers in both fixed and mobile installations, functions with tactical units, dental property, reports and records, dental surveys, training enlisted technicians, relationship of dental officers to others of the Medical Department and of the arms and services, first aid to and evacuation of jaw casualties, and approved splinting methods employed in the field.

From the Dental Division of The Surgeon General's Office.

VISITING CONSULTANTS TO THE 5TH ARMY

After a period of training and planning in Morocco, the 5th Army became engaged in the Italian Campaign. In a report on the medical history for the year 1943, Brigadier General J. I. Martin, army surgeon, states that the following consultants visited the 5th Army and gave valuable advice regarding new techniques, organization, evacuation, equipment, and the use of trained personnel:

Lt. Col. K. A. D. Allen	X-ray
Lt. Col. Ralph Toxell	Anesthesia
Major F. A. Simeone	Surgery
Major H. K. Beecher	Anesthesia
Colonel P. E. Howe	Nutrition
Colonel E. D. Churchill	Surgery
Colonel Perrin Long	Medicine
Major Frederick Hanson	Psychiatry
Major John D. Stewart	Surgery
Lt. Col. L. A. Dewey	V. D.
Lt. Col. D. M. Pillsbury	V. D.
Colonel K. H. Von Nostrand	Psychiatry
Colonel Lloyd J. Thompson	Psychiatry
Colonel Elliott C. Cutler	Surgery
Colonel Johan Holst, director, Medical Service, Norwegian Army.	

Major Howard Snyder, M.C., was appointed surgical consultant, 5th Army, on 17 November 1943. He had as his assistant Captain Floyd H. Jergesen of the 2d Auxiliary Surgical Group.

DISTRIBUTION OF SANDFLY FEVER

Sandfly fever is a self-limited disease of from two to four days' duration caused by a filtrable virus and transmitted by small biting flies belonging to the genus *Phlebotomus*. The geographical distribution of sandfly fever is not known exactly because of the uncertainty of diagnosis. It has been reported throughout the Mediterranean basin and the Near East, in eastern Africa, and in parts of southern Russia, India, Burma, and China, and, it is claimed, in southern Japan, the Ryukyu Islands, in northern Argentina, and other parts of South America. The disease has frequently been confused with dengue and other fevers when facilities for blood smear examinations were not available. Although sandfly fever never causes fatalities, an epidemic may cause a high non-effective rate among military personnel. Prevention depends primarily on control of sandfly vectors of which *Phlebotomus papatasi* is the most important. While standard screening used by the Army will not keep out the small sandflies, repellents and aerosol insecticide "bombs" are effective.

Sandfly fever in the present war has occurred chiefly in the North African, Middle East, and China-Burma-India Theaters, where the season of greatest incidence corresponded closely to the season of sandfly prevalence. As the North

African invasion occurred in November 1942 after the season for sandflies, the disease was not reported until August 1943, with the peak of admissions in September. No cases were reported for the first five months of 1944 and only two cases in June 1944.

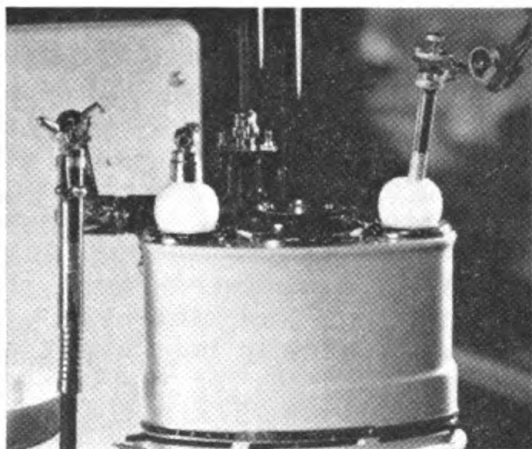
The highest incidence reported for 1942 and 1943 was in the Persian Gulf Command where a peak of admissions was reached in August 1942. The disease almost disappeared during the following winter, but a sudden increase occurred in May 1943. No cases were reported after December 1943 until April 1944, when eleven cases were recorded.

The first report of sandfly fever from the China-Burma-India Theater was in September 1942; except in October no other cases were reported until February 1943. A sharp peak in admissions occurred in July 1943. By October the rate had declined. No cases were reported in the first five months of 1944 and only two cases in June 1944.

These theaters may have an increased incidence of sandfly fever during the season of 1944, but early reports indicate significant improvement over the corresponding periods of previous years.

STERILIZATION OF DENTAL HANDPIECES

Having read the item on page 19 of the June *Bulletin*, Lieut. Colonel T. J. Hagen, D. C., reports that the following technique for the sterilization of dental handpieces has been used success-



fully at the Oakland Area Station Hospital and may interest other dental officers. He states: "It was found that by cutting the metal ferrule off one of the atomizer bottles at the junction of the glass and metal the contra-angle attached to the straight handpiece would fit into the atomizer; it was further found that mineral oil (heavy) would boil in approximately ten minutes when the thermostat was

set at 5. The thermostat is maintained at 3 at all times when operating. The operator estimates how long the contra-angle will be used, and approximately ten minutes before completion the assistant sets the thermostat at 5; thus, by the time the patient is dismissed, the contra-angle is cleaned and sterilized by running in the hot oil.

"The oil may be flavored by oil of peppermint or any essential oil."

ANAEROBIC CULTURE APPARATUS

The Laboratories Division of The Surgeon General's Office has formulated instructions for the use of Anaerobic culture apparatus, Smillie type (Med. Dept. Item No. 4007700).

Heat the glass bulb containing the platinized asbestos over a free flame for a few seconds; then cement the cover on the jar. Place a rubber ring, 0.5 cm. thick, between the jar and cover; cement all surfaces with Major's glass cement, plasticine, or similar substance, and screw down the metal clamp. Place on the vacuum pump the stopcock to which the glass bulb is connected and apply gentle suction from two to three seconds to ensure a good initial flow of hydrogen and thus ignite the platinized asbestos at once. Now close the stopcock and attach to the hydrogen apparatus, and allow the gas to enter. This should be done carefully at first to prevent entrance of excess hydrogen, for the gas should be burned as rapidly as it enters the jar. The platinized asbestos will soon glow and, from this time, hydrogen and oxygen will slowly unite. The water thus formed will be deposited on the sides of the jar. When all of the oxygen has united with the hydrogen, the platinized asbestos will become cool, but the hydrogen will continue to enter the jar until all the space formerly occupied by oxygen is replaced by hydrogen. The result is a hydrogen-nitrogen jar at about atmospheric pressure. The whole process should take about fifteen minutes.

Emphasis should be placed on the following points: (1) Mixtures of oxygen (air) and hydrogen are *extremely explosive*. These gases must be used with caution, especially during the introduction of the hydrogen and at the time of removing the jar lids. Care should be taken to employ the apparatus in a room in which there are no open flames or sources of electric spark. (2) Attempts to evacuate the jars completely will result in their breaking by collapse. Only a partial vacuum, just sufficient to initiate the flow of hydrogen into the container, should be produced. (3) The rate of flow of hydrogen into the jar must be slow to avoid excessive concentration of the gas and possible explosion.

The Smillie apparatus consists of a stock museum-type glass jar, twelve inches high and six inches in diameter. The glass lid, containing two holes for fitting of inlet and outlet devices, is held in place by a screw clamp. A rubber gasket covers the upper surface of the jar to permit a tight seal between it and the lid. The accessories include a metal clamp for holding the lid in place, a perforated glass bulb as a container for platinized asbestos, two glass stopcocks; molding clay, glass cement, or plasticine; and a supply of rubber tubing and stoppers. The equipment does not provide for, nor require, electric heating of the platinized asbestos. Hydrogen from a Kipp generator or tank is to be used.

There are other types of anaerobic apparatus available to which these instructions do not apply.

FALSE POSITIVE WASSERMANN REACTIONS IN MENINGITIS

Seven cases of confirmed false positive Wassermann reaction in spinal fluid in nonsyphilitic individuals during the course of meningitis have been reported by Scott, Reynolds, and Mohr¹ from the U. S. Public Health Service and the Johns Hopkins University Venereal Disease Research and Post-Graduate Training Center. In 3 instances the meningitis was tuberculous; in 2, meningococcal; and in 2, aseptic lymphocytic. Apparently these false reactions are ordinarily transitory in character. The authors conclude that the diagnosis of neurosyphilis based on a positive spinal fluid Wassermann reaction alone is unjustified in patients suffering from meningitis and other intracranial disorders until repeated examinations, performed after these processes have subsided, demonstrate the continued presence of reagin.

SOUTH PACIFIC LAUNDRIES

Mobile and fixed laundries operated in the South Pacific Area by the Quartermaster Corps are serving troops on scattered islands, cleaning hospital linens, clothing for officers and enlisted men, and organizational equipment. Laundry units were put ashore with the assault troops in some out-of-the-way places, and as the troops moved forward the laundries were shipped to new operating bases hacked out of the jungle. Replacements and spare parts were difficult to obtain at such places as Guadalcanal, Kolumbangara, and Espiritu Santo, as shipments had to be sandwiched in between priorities. The total number of articles laundered by both types of units from July 1943 through March 1944 was more than 18,860,000.



First American nurses to arrive in Italy. They are assigned to an evacuation hospital. Paestum, 15 September 1943. Signal Corps photograph.

1. Am. J. Syph., July 1944, page 431.

THE INTERNIST AT WAR*

As is to be expected, internal medicine has established a record of accomplishment in the Army and Navy which reflects the extraordinary achievements of the past twenty-five years in civilian practice. Those of us here who, in 1917-1918, took care of soldiers and sailors with sinusitis, bronchitis, pneumonia (lobar and postinfluenzal), cerebrospinal meningitis, septic disease, tuberculosis, dysentery, syphilis, gonorrhea—to mention the diseases most frequently encountered in military practice—will appreciate the significance of the following figures. Obviously, they are neither absolutely accurate nor final; nevertheless, they are both informative and significant.

Meningitis	.....World War I	.....Fatality,	38%
	World War II	.....Fatality,	4%
Pneumonia	.....World War I	.....Fatality,	28%
	World War II	.....Fatality,	0.7%
Tuberculosis	.....World War I	.....Fatality,	17.3%
	World War II	.....Fatality,	1.8%
Dysentery	.....World War I	.....Fatality,	1.6%
	World War II	.....Fatality,	.05%

Finally, let us examine the record of preventive and curative medicine in this war as reflected in the annual death rate per 1,000 for all diseases in the Army, excluding surgical conditions:

World War I	.....15.6
World War II	..... 0.6

This is a way of saying that a division of 10,000 men in 1918 would experience 156 deaths per annum from diseases (excluding injuries). This same division in 1944 loses 6 men by death from disease. This is a reduction in death rate greater than 95 percent!

To what are these extraordinary results due? They are due to: (1) the high level of professional competence in internal medicine in the Army; (2) careful placement of this professional competence where it will do the most good in the Army; (3) provision, for medical officers, of adequate diagnostic and therapeutic facilities with which to work; and (4) the extraordinary devotion to duty of Army and Navy doctors.

ITEMS FROM THE SUPPLY SERVICE

Splint accessory sheet aluminum, 16-gage, 18 by 24 inches (Med. Dept. Item No. 3765000), for making splints for the wrist and forearm, is available for stations which have been authorized to establish orthopedic shops.

Pituitary solution, posterior lobe, U.S.P., (Med. Dept. Item No. 1353000) is now being procured with an expiration date two years after the date of manufacture. This item should be stored in a refrigerator, at a temperature of from 30° to 40° F.

*Extracts from an address before Annual Meeting of American College of Physicians, Chicago, 31 March 1944, delivered by Brig. General Hugh J. Morgan, Chief Consultant in Medicine, Office of The Surgeon General.

MOBILIZING SPLINTS IN TREATMENT OF MOTOR NERVE INJURIES

Captain John B. Feltner, M.C., reports from a station hospital in the Mediterranean Theater on the use of a type of splint for peripheral nerve injuries which mobilizes the paralyzed parts rather than holds them rigidly in one position from the time of the original injury. In devising this type of splint the following principles

were considered important: (1) the splint should substitute for the motor function of the paralyzed nerve; (2) it should allow the function of the counteracting or nonparalyzed muscles—the antagonists; (3) joints which

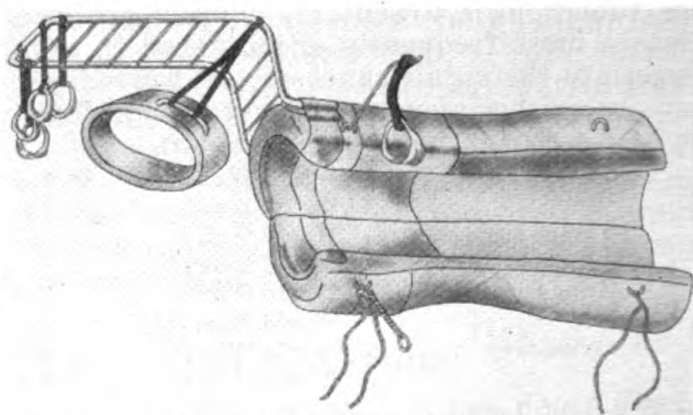


FIGURE 1. Showing the bivalved, hinged, removable character of the splint.

do not need to be immobilized for maintenance of fracture reduction should have full range of motion. A number of writers have described types of mobilizing splints which can be manufactured by orthopedic brace shops and used in the treatment of muscle palsy. Mayfield¹ for example described a similar apparatus used in the Percy Jones General Hospital at Battle Creek, Michigan.

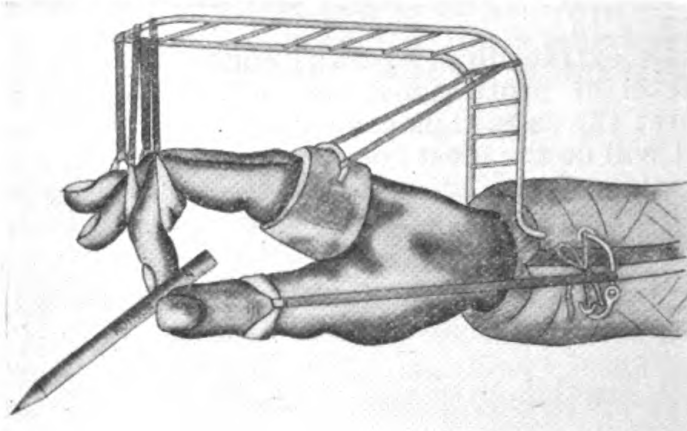


FIGURE 2. Function regained with mobilizing splints.

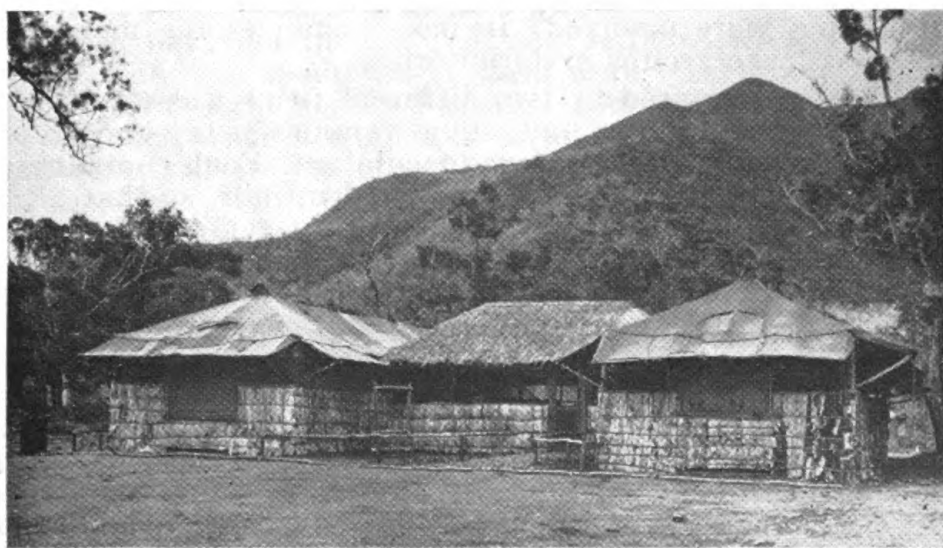
Feltner reports that during the last sixteen months of treatment of war injuries, a striking number of peripheral nerve injuries complicating wounds of the extremities has been observed. The extremely important débridement and

toilet of the wound is the first step, and the reduction and immobilization of the fracture, if present, the second step. They instituted treatment of the nerve injury along with treatment of the wound or the fracture, and for this purpose, they have used a simple mobilizing splint (see illustrations) made from wire, rubber bands, and plaster of paris.

1. The Bulletin, February 1944, p. 96.

The most frequent nerve palsy encountered was of the radial nerve, due generally to shrapnel or bullet wound. The fracture and the wound being of first importance were treated by débridement, petrolatum gauze, sulfonamide crystals, and plaster of paris immobilization; but instead of following the rigid cockup position for the hand and wrist they included on the dorsum of the forearm cast a wire ladder splint, projecting dorsally and then angled distally over the hand, from which rubber traction bands are suspended to fingers, to the dorsum of the hand, and to the thumb. For abduction of the thumb it is necessary to have the site of the origin of the rubber traction band on the radial side of the forearm. This method of splintage was used with forearm casts, hanging casts, and thoraco-brachial casts, depending on the nature of the injury and the stage of treatment. When the original wound and fracture no longer needed to be considered, they used the removable, bivalved, hinged, plaster forearm splint.

The advantages of a removable splint are obvious. The patient can bathe and physiotherapy of the forearm can be instituted. The same principles may be applied to median, ulnar, circumflex, sciatic, and peroneal palsies. The time-honored rigid splinting produces atrophy of nonparalyzed muscles, loss of mobility of joints, adherence of tendon structures, and thus a bad prognosis as to future function despite later successful nerve regeneration. Mobilizing splintage maintains normal range of joint movements, keeps nonparalyzed muscles in active use, prevents tendon adhesions and decreases the time required for future rehabilitation of the part.



Station hospital medical supply building in a South Pacific Area.
Signal Corps photograph.

VACCINATION AGAINST INFLUENZA

A clinical trial of the prophylactic efficacy against epidemic influenza of a concentrated, inactivated vaccine containing the viruses of influenza types A and B was undertaken in the autumn of 1943 by members and associates of the Commission on Influenza, Board for the Investigation and Control of Influenza and other Epidemic Diseases in the Army, with Dr. Thomas Francis, Jr., as director. A preliminary clinical evaluation of the influence of the vaccination has been published.¹ The vaccine was prepared by biologic firms according to specifications furnished by the commission. Virus was obtained from the allantoic fluid of embryonated hen's eggs inoculated forty-eight hours earlier. The virus was concentrated about ten times in isotonic solution of sodium chloride following adsorption to, and elution from, the embryonic erythrocytes. The infectious capacity was inactivated by solution of formaldehyde 1:5,000. Phenyl mercuric nitrate 1:100,000, or borate 1:50,000, was then added for bacteriostatic purposes. Each 1.0 cc. of the vaccine was made up of 0.5 cc. representing type A virus recovered from 5.0 cc. of allantoic fluid and 0.5 cc. representing the type B virus recovered from 5.0 cc. of allantoic fluid. The type A component represented equal parts of the PR8 strain and of the Weiss strain, isolated in May 1943. The type B component contained only the Lee strain. Control material consisting of isotonic solution of sodium chloride to which solution of formaldehyde 1:5,000 and phenyl mercuric nitrate 1:100,000 were added was prepared, bottled, and subjected to the same tests for sterility.

The study was carried out in Army Specialized Training units of eight universities in different parts of the United States and a ninth group comprising the members of A.S.T. units of five New York medical and dental colleges. About 12,500 men were involved. In most instances the men were housed as large groups in dormitories.

Vaccine prepared by two different firms was used in all locations. Except in one unit, equal volumes of the two preparations were mixed just before inoculation. Each company or organization within a unit was divided in half, so that alternate individuals received, respectively, vaccine and control material. One dose of 1.0 cc. was given subcutaneously. The records containing this information were removed to other quarters. The observer had no information as to whether a patient belonged to the vaccinated or the control group.

Prior to vaccination and throughout the period thereafter, all individuals reporting to sick call were closely observed by members of the investigating groups. Influenza was diagnosed in individuals who had symptoms suggestive of influenza (i.e., rapid onset with mild upper respiratory complaints, chilliness, aches, and prostration) and who were admitted to

1. J.A.M.A., 124:982-985, 1 April 1944.

hospital with sublingual temperatures of 100° F. or more without obvious evidence of other disease. Fresh typical common colds, characteristic follicular tonsillitis, and infectious mononucleosis were excluded from the diagnosis of influenza. In general, it appears that the criteria adopted would tend more to the inclusion of cases which were not influenza than to the exclusion of cases which were influenza.

An epidemic of influenza A was first identified in the Middle West about the second week in November and the disease was recognized in other localities within a short time. It was in general mild, of three to four days' duration, and with a low incidence of complications. The results for the respective units were compiled and in all but one instance a report was submitted to The Surgeon General's Office before the evidence obtained in other locations was known.

The incidence of clinical influenza in the 6,211 men receiving control material was 7.11 percent, while in the 6,263 receiving vaccine it was 2.22 percent, a ratio of 3.2 to 1. In general, the difference between vaccinated and control individuals was greatest at the height of the epidemic curve, and as the epidemic subsided the differential was less noticeable. The duration of the effect is not known.

The results at the College of the City of New York and at the University of Iowa, where vaccination was begun after the epidemic was in progress, indicate that the effect of vaccine becomes evident in about one week after inoculation. In these instances the attack rates in the vaccinated and controls were not especially different during the first week, but after that time they diverged sharply.

TREATMENT OF ACUTE SPRAINED ANKLE

Ten cases of severe acute sprained ankle in an aviation engineer battalion in the Central Pacific Area were treated by local anesthesia and all of them were returned to full duty within forty-eight hours. Patients from this battalion treated by the time-honored method of firmly taping the injured part had remained in the hospital for ten days. Captain Selvan Davison, M.C., with the cooperation of Captain J. A. Petrazio, M.C., reported the use of local anesthesia, realizing the method is not new and hoping that medical officers in other areas will find it equally helpful.

They first made a careful examination of each case with a complete history of the injury and had roentgenograms taken to rule out the possibility of a fracture. If no fracture was present, they marked all areas of tenderness on the ankle by pressure with the end of an applicator stick. The areas were painted with 3½ percent tincture of iodine, the operator's hands were carefully washed then rinsed in 70 percent alcohol, and a sponge soaked in alcohol was applied to the tender areas throughout the procedure. With 2 percent pro-

caine with 1:50,000 epinephrine, a small bleb was raised over each area of tenderness, and infiltration into the deeper tissue followed through each bleb. Six cc. of procaine was usually sufficient for the entire procedure. The injection was discontinued after no further tenderness was found anywhere by deep pressure or by full-range motion of the ankle. A dry dressing was applied to the infiltrated area. The patient was told that a dull pain would return in a few hours, but to go about ordinary routine while the anesthesia persisted. He was encouraged to walk without limping, to favor the injured ankle as little as possible, to refrain from heavy duty for twenty-four hours, then to report back to the aid station. In forty-eight hours all the patients had returned to regular heavy work on the runways, truck driving, and bulldozing.

FRACTURE OF IMPACTED WISDOM TOOTH

The fracturing of an impacted wisdom tooth into nine separate fragments by an exploding shell is an unusual dental casualty. Major H. E. O'Keeffe, D.C., reports a case in a soldier, age 28, who came to the dental clinic complaining of pain in the upper right third molar area. He gave a history of a 20-mm. shell's exploding in the cockpit of the airplane he was piloting in combat, causing fractures of the right frontal and maxillary bones and multiple superficial wounds; complete loss of sight in the right eye resulted.

Examination of the mouth revealed that only the tip of the mesiobuccal cusp of the upper right third molar had punctured the gum tissue, which was moderately inflamed and tender. A foul odor came from this area. Radiographic examination revealed an impacted upper right third molar in a comminuted condition. Clinical and radiographic examination did not reveal damage to any other teeth.

With the application of poultices and hot saline solution for two days, the acute symptoms subsided and the impacted tooth was removed under local anesthetic. Removal was simplified because the crown had already been severed from the roots.

None of the multiple fragments were caused by operative procedure but were all due to the fracturing of the tooth by the exploding shell. The pulpal tissue had completely broken down into putrescent, purulent matter. Recovery was uneventful.



EVACUATION OF WOUNDED IN BURMA

Colonel Don Flickinger, M.C., who has returned to the United States from Burma, told of the sick and wounded evacuated by air transport in the China-Burma-India Theater. Hundreds of Chinese soldiers wounded in action in Burma are loaded on C-46's of the ATC and flown to hospitals. Hundreds of other casualties of the Allied ground forces fighting in Burma are evacuated by air. Six regular air evacuation "runs," one of them over The Hump, are made by the Air Transport Wing each week. The patients are cared for by flight surgeons and flight nurses.

Air evacuation medical personnel face the same hazards that the ATC pilots do on such runs. In one instance a flight nurse, a flight surgeon, and an enlisted surgical technician were wounded when Japs bombed and strafed the field as they were taking off in a plane.

The health of the personnel making the dangerous trips over The Hump, taking supplies to China, is good. Better sanitation, food, living conditions, emergency rescue, training, and rotation of air crews back to the United States, have greatly improved the physical and mental status of the personnel. With efficiency thus increased, pilots are making seventy to seventy-five trips over the Burma jungles and peaks



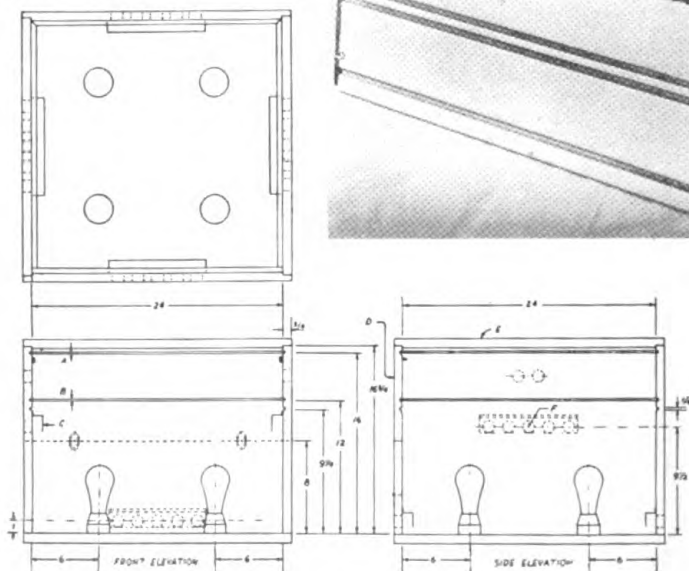
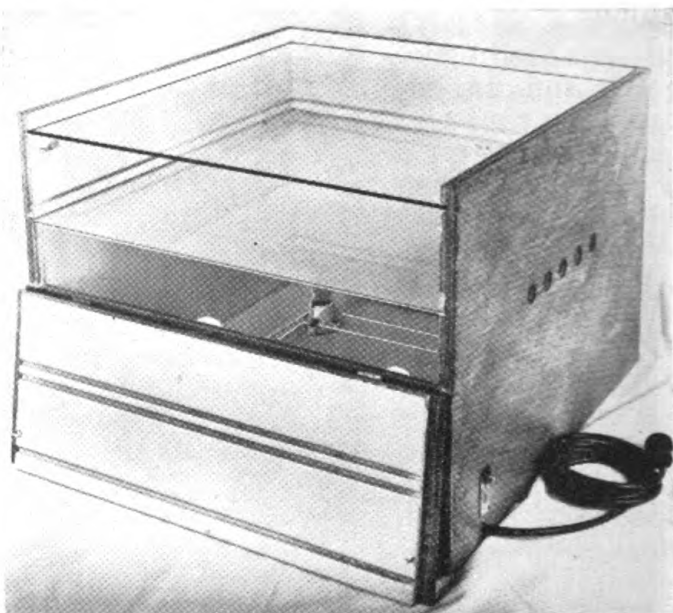
Medical Supply Bundle, A-5 Container, assembled as when ready for dropping from airplane in Australia. Standing beside it is Pfc. C. A. Falanga of Philadelphia, Pa. Signal Corps photograph.

of the Himalayas without undue fatigue. A year ago forty-five to fifty-five trips were considered all a pilot could make without undue strain.

Colonel Flickinger in 1942 was awarded the Legion of Merit for experiments with devices to aid in sighting pilots forced down at sea. He also holds the Distinguished Flying Cross, Soldier's Medal, Air Medal, and Distinguished Unit Badge. In August 1943, he parachuted with medical supplies to the aid of twenty survivors of a four-engine transport plane which crashed in a wild region of Burma.

SHADOW BOX

A ply board shadow box for photographing surgical specimens and for preparing x-ray or other tracings has been developed by Lieut. Colonel Russel H. Patterson, Major Frederick M. Anderson, and Captain George T. Aitken at Letterman General Hospital. Fluorescent lights can advantageously be substituted for the ordinary 50-watt Mazda lights shown, as they will not heat the box.



An additional plate of flashed opal or ground glass may be inserted in the empty slot below *B* if a lesser degree of illumination is desired. Cover is removed in photograph.

A, plate glass; *B*, single flashed opal glass; *C*, sheet metal light-baffles; *D*, drop panel; *E*, removable lid; *F*, 1-in. diameter holes on 2-in. centers.

All views shown are sectional—surface detail shown in broken lines. Inside of box to be painted matte white.

THE NEW MEDICAL SUPPLY CATALOG

The new Army Service Forces Medical Supply Catalog now being distributed throughout the Army was prepared in accordance with specifications for service catalogs recently established by Headquarters, Army Service Forces. It is an attempt to provide a catalog intelligible to Medical Department soldiers and others who had no experience of medical practice or supply prior to entering the Army.

The principal differences between the new catalog and its predecessor are: the item numbering system, the nomenclature of many items, and, in some instances, the units have been changed; the prices have been revised and corrected throughout the book; and a new "Status" column has been added.

The seven-digit numbering system is not as new as it may appear to be; actually it has been in use since 1941, although in previous catalogs the two final digits were not published. These terminal digits, which may have been noticed in shipping documents and similar papers, were used by the depots to show size, voltage, manufacturer, or other facts which might have a controlling influence over item use, but which did not apply to all items carried under the first five digits of the item number.

The nomenclature or description of many items has been made clearer and more accurate and, it is believed, the changes are self-explanatory. In case of drugs, bandages, and other items for which the unit is other than "each," the quantity or amount contained within the standard unit package is shown by a numeral before the colon. In these cases, the type of package (bottle, can, jar, box) is shown in the "Unit" column.

With the steady reduction in unit costs resulting from expansion of the supply program, the prices shown in previous catalogs became less and less accurate. The new prices are based on average procurement contract prices over a period of one year, and they will be revised annually.

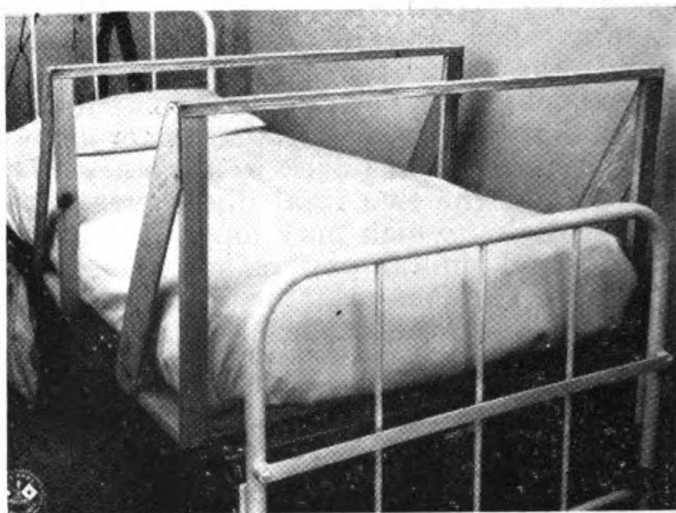
The status ("Standard," "Limited Standard," or "Substitute Standard") of all Medical Department items is shown in the "Status" column of the new catalog. This classification is in accordance with AR 850-25, "Development, Classification of, and Specifications for Types of Equipment." It supersedes the old "IWIS" classification (issue while in stock), under which certain items were taken from their normal numerical positions and grouped together in a special section of the catalog.

The new catalog contains about 1,800 illustrations which show, in general, the types usually issued. They cannot be used in reports of surveys and other situations where accurate item identification is required, as types may change and items of varying appearance and design may be issued under one item number.

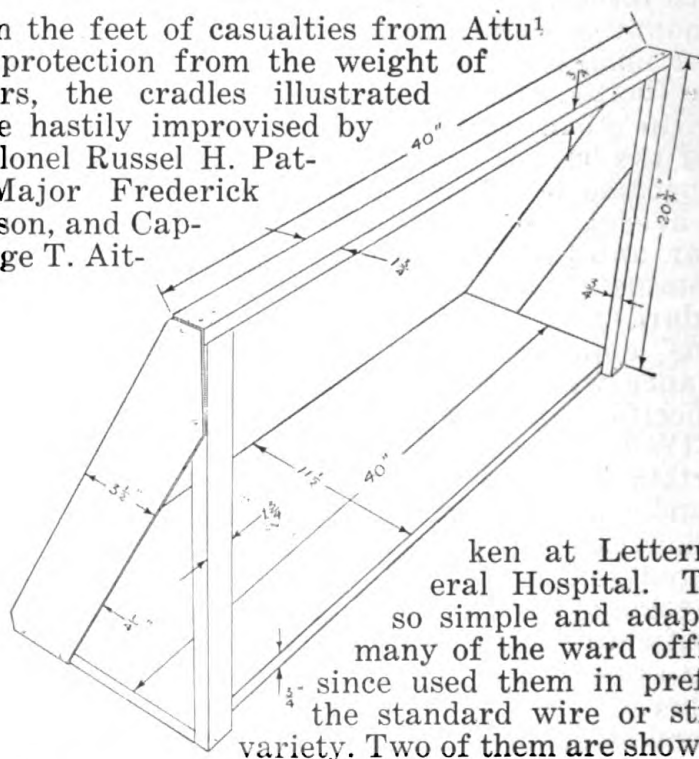
The new Medical Supply Catalog will make requisitioning, stockkeeping, and item identification easier. Without a complete inventory of all Medical Department property, there

is no way of being sure that the nomenclature and description of an item as given in the catalog covers the entire stock of items carried under that item number, and no other item or items. If cases in which doubt as to the accuracy of item number and nomenclature are reported to the Catalog Branch, Office of The Surgeon General, the catalog can, year by year, be made more accurate and informative.

IMPROVISED CRADLE



When the feet of casualties from Attu¹ required protection from the weight of bed covers, the cradles illustrated here were hastily improvised by Lieut. Colonel Russel H. Patterson, Major Frederick M. Anderson, and Captain George T. Ait-



ken at Letterman General Hospital. They were so simple and adaptable that many of the ward officers have since used them in preference to the standard wire or strap metal variety. Two of them are shown in place.

1. The Bulletin, April 1944, page 62.

INFRA-RED EQUIPMENT

A need arose in a theater of operations for infra-red therapy for back and ankle injuries. The necessity for economy in using gasoline and the distance to the station hospital induced Captains Sidney Friedenberg and Charles R. Wine to improvise an apparatus for this purpose. A discarded five-gallon steel can was slit along the long axis and opened enough to accommodate the width of a man's pelvis. Two wooden bars were placed inside in which a cut-out No. 10 tin can, volume about one gallon, could slide and serve as a reflector for a 100-watt light bulb. This could be removed with the switch to facilitate packing (figure 1). With the baker in operation (figure 2) a blanket is placed over the unit to conserve heat.

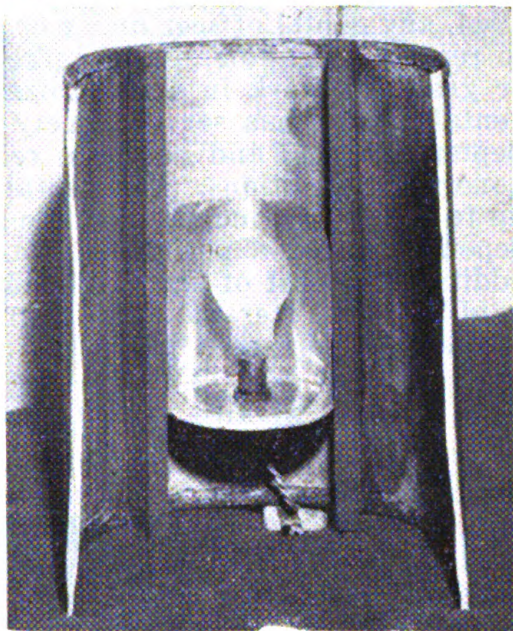


FIGURE 1



FIGURE 2

The results with this apparatus have been as good as those expected from professional equipment. It is practical in any Army dispensary which has access to electrical power.*

Cultivation of Medicinal Plants.—Ipecacuanha roots have become one of the leading export items of Nicaragua and Costa Rica. El Salvador is the chief source of balsam. Costa Rica and Honduras are supplying sarsaparilla. Guatemala and Costa Rica are developing a cinchona plantation industry. Guatemala also is planning cultivation of digitalis and belladonna.

*Technician Third Grade William C. Holland and Corporal Yvo F. Bussan constructed this apparatus.

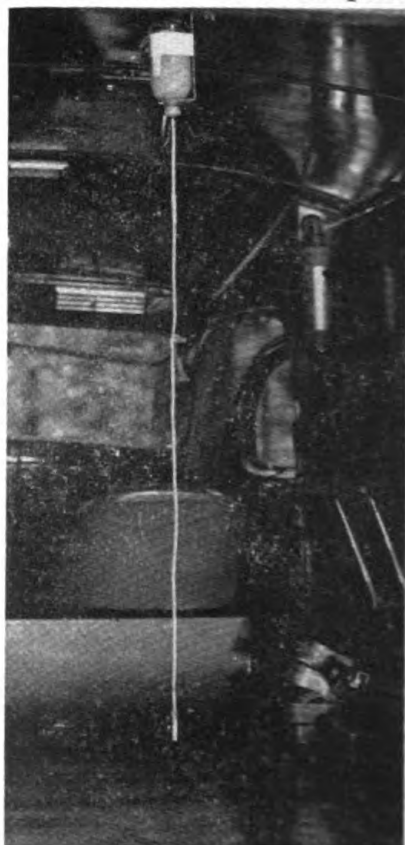
POSTWAR TRAINING FOR DENTAL OFFICERS

In accordance with the most recent interpretation of the Program for Education and Training under Part VIII of Veterans' Regulations 1(a), as amended, Public Law 346, 78th Congress, in a letter from the Veterans' Administration, 24 July 1944, any dental officer under or over 25 years of age is eligible to receive a year or less of refresher, retraining, postgraduate, or graduate work in a recognized dental school, provided said dental officer has served ninety days or more on or after 16 September 1940 and has been released from active duty under honorable conditions. The dental officer will receive a stipend up to \$50.00 per month if single and \$75.00 if married or with dependents, for a period not to exceed twelve months, and in addition the cost of the tuition, instruments, and books will be paid by the Veterans' Administration to the institution in an amount not to exceed \$500.00.

BLOOD PLASMA BOTTLE HOLDER

The administration of plasma is frequently necessary during the transportation of a patient in an ambulance. This requires an additional attendant to steady the bottle. Space in the ambulance and attendants may indeed be limited.

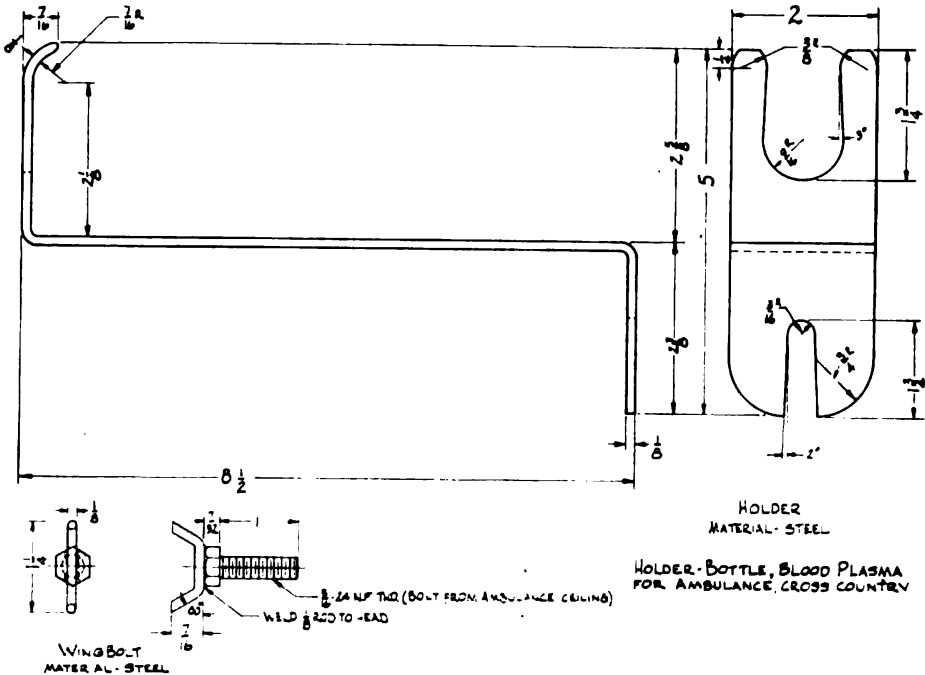
In response to requests for a device to hold a plasma bottle stationary in a moving ambulance, the Medical Department Equipment Laboratory, Carlisle Barracks, has developed the holder illustrated, for use with either the 250 cc. or 500 cc. plasma bottle. It is a simple improvisation using a flat piece of steel which is bent and cut and a small bolt with a piece of rod welded to the top to form a wing bolt.



Left—near view of bottle holder. Right—holder attached to roof of ambulance.

The holder is installed by removing one bolt from the strap bracket in the top of the cross-country ambulance. A piece of

$\frac{1}{8}$ -inch rod is welded to the head of this bolt or one like it, thus making the bolt easily fastened or loosened by hand. The holder is slipped under the head of the wing bolt with the $\frac{3}{8}$ -inch slot straddling the bolt. Tightening the wing bolt secures the holder. The plasma bottle is inverted and the neck inserted in the $1\frac{1}{8}$ -inch slot. It is held in place by tying the cloth tape around the vertical portion of the holder as shown in the photograph.



With this arrangement, the administration of plasma can continue, without an attendant, during movement of the ambulance.

DENTAL EXAMINATIONS IN NEW GUINEA

Dental examinations were made of 308 native New Guinea males between 15 and 35 years of age, by Captain Oscar Bean, D. C.; 208, or about 67 percent of the group, had no missing teeth or cavities; 57 or about 18 percent, required some emergency dental service such as extractions, treatment of acute infections, or dentures. Fifteen percent of the men examined were in a class II dental classification, which means that they had some cavities or required other restorations, but not of an emergency nature. There were no impacted third molars and practically no malocclusion. Some of the mouths had heavy deposits of calculus but little gingivitis or pyorrhea. Many of the buccal surfaces were stained red, probably the result of chewing betel nuts and lime. The natives, with few exceptions, do not use toothbrushes. The native diet consists chiefly of raw and cooked starchy fruits and vegetables. Their vegetables are definitely not "overcooked."

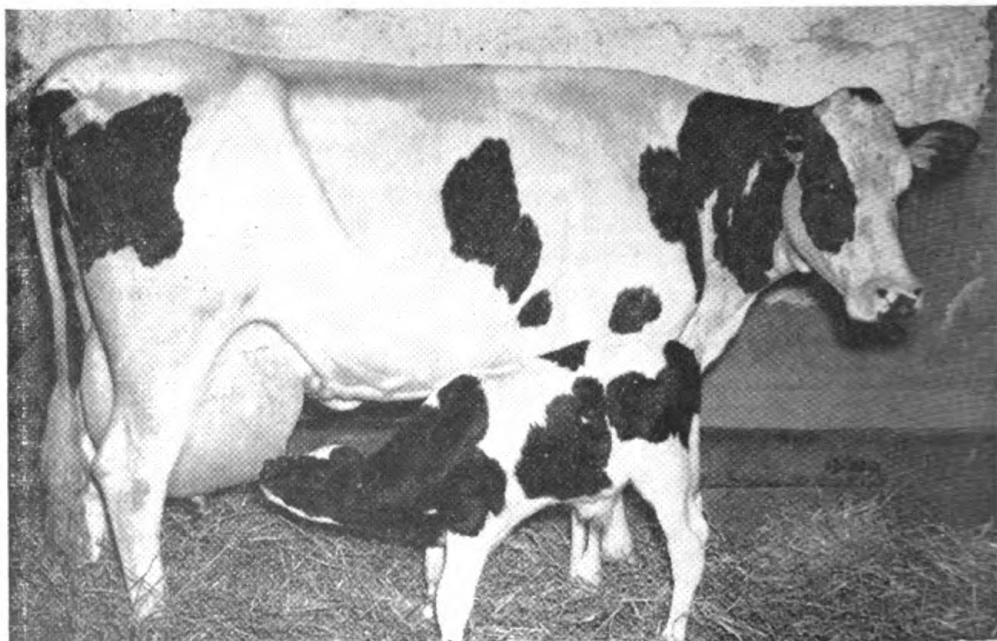
From the Dental Division of The Surgeon General's Office.

CARE OF SAMPLES OF MILK

Surveys of milk supplies in the service commands have shown that improper care is frequently given to samples of milk taken for bacterial analysis. The samples are often allowed to increase in temperature either before delivery to the laboratory or by remaining on a laboratory table for considerable time before plating or placing under refrigeration.

The rate of bacterial multiplication at different temperatures varies with the type and the number of bacteria in the milk. Numerous determinations, however, show that with milk containing about 5,000 bacteria per ml. there is practically no increase in bacterial content in twenty-four hours if it is held at 40° F. On the other hand, an increase in bacterial content of over three to one and about four hundred to one may be expected when such milk is held for twenty-four hours at temperatures of 50° F. and 60° F., respectively. As a rule the rate of bacterial multiplication in milk with a high bacterial count is more rapid than it is in low-count milk.

The purpose of taking samples is to determine that the milk as delivered meets specification requirements. Permitting bacterial growth to take place after samples are taken defeats this purpose. Furthermore, the vendor is entitled to have his product approved or disapproved on the basis of its condition at the time of delivery. Care, therefore, should be taken to see that milk samples are properly refrigerated from the time they are taken until they are plated and that the time elapsing between these operations is as short as possible.



The U. S. Soldiers' Home, Washington, D. C., owns this famous cow which in ten months produced 15,241.2 pounds of milk with 599.4 pounds of butterfat. Washington, D. C., Times-Herald photograph.

RECENT DIRECTIVES AND PUBLICATIONS

This list is intended as only a brief reference to the items mentioned. Before acting on any of them, the original communication should be read and request for copies, when made, should be directed to the source of the communication through proper channels.

WD Technical Bulletin
TB MED 60
29 June 44

Laboratory. Calls attention to recent knowledge of inhibitory effect of excess concentrations of para-aminobenzoic acid on certain bacteria, and recommends 0.2 mg. percent of the drug be incorporated in blood, urine, and spinal fluid culture media. In special circumstances this amount may be increased.

WD Technical Bulletin
TB MED No. 37
28 April 44

Laboratory. Instructions for Operating Kit, Water Testing, Poisons, Treatment Control. Describes Med. Dept. Item No. 9930700 containing apparatus and chemicals to carry out quantitative determinations of "mustards," "arsenicals" (L), pH, and "chlorine demand"; also equipment for specific qualitative tests for cyanide, lead, thallium, mercury, and selenium. Its inclusion in the T/O and T/E of numbered general hospitals places it where qualified personnel are available for carrying out the tests. It has also been included in T/O and T/E of other units which might need this equipment.

WD Technical Bulletin
TB MED No. 78
4 Aug. 44

Laboratory. Taking of Blood Specimens. Calls attention to danger of transmitting infectious hepatitis by improper technique in blood-letting. The method of choice when many samples are taken, as in induction examinations, is with the needle and test tube alone. (See TM 8-227, paragraph 40). Specific recommendations regarding sterilization of syringes and needles are made.

AR 40-310
3 July 44
C 1

Army Medical Museum. Makes provisions re shipment of insects and arthropods and specimens of mammals of medical importance to Army Medical Museum for study. [Specimens of mammals, particularly rodents of medical importance, which have not previously been recognized as significant in the area where collected and assumed or known to be involved in transmission of disease are desired by the Army Medical Museum for correct identification. The mammalian faunas in particular of North Africa, Asia Minor, India, East Indian and Pacific Islands, and South America are inadequately represented in collections that are consulted.]

AR 40-305
5 July 44
C 2

Laboratories. Changes par. 6d, AR 40-305, 14 Nov. 1942, to provide that C.O. of a laboratory will transmit to Army Medical School such cultures or culture data as in his opinion require further study or as are requested by The Surgeon General. [Cultures of the Shigella and Salmonella groups which cannot be identified are especially desired as well as Shigella dysenteriae (Shiga bacillus), (at least one culture from any single case or group of cases occurring at one time in one area); Salmonella paratyphi (para A), and Salmonella hirschfeldii (para C).]

WD Circular No. 277
5 July 44

Specimens—Collection of. Makes provisions re collection of specimens—parasitological, entomological, mammalian, and reptilian.

WD Technical Bulletin
TB MED 47
28 May 44

"Control of Diseases of Respiratory System and Other Diseases Transmitted by Discharge from Respiratory Tract."

ASF, Headquarters
Circular No. 164
31 May 44
Part Two, Sect. VII

A.S.T.P. —Veterinary Training. Present senior class of veterinary medicine trainees in A.S.T.P. to continue training until graduation. Further training of junior, sophomore, freshmen, and pre-veterinary trainees to terminate at end of term which started before 22 May 1944. No additional enlisted men to be assigned to A.S.T.P. for such training. Sets forth instructions re termination of such A.S.T.P. contracts.

WD Circular No. 217
1 June 44
Sect. V

Physical Examination. Rescinds Sect. I, W.D. Cir. No. 171, 1941: (1) annual physical examination of officers, warrant officers, and nurses of Regular Army is discontinued; (2) physical examination for promotion of officers of all components to be discontinued except for Regular Army officers upon permanent promotion; (3) physical examination of officers of any component or branch may be ordered by higher authority when considered advisable.

ASF, Headquarters
Circular No. 169
5 June 44
Part One, Sect. I

Enlisted Men—Psychoneurotics. Refers to Sect. II, ASF Cir. No. 40, 1944. Makes provisions re utilization and assignment of recovered psychoneurotic enlisted men. To determine effectiveness of present developmental training program for psychoneurotics, unit commanders to submit reports on recovered psychoneurotics to service command showing manner of performance of military duty.

Part Three, Sect. VII

Officers. When considered that officer of Regular Army should be removed from active list under provisions of Public Law 190, report to be made by chiefs of technical services and others to C.G., A.S.F. (Attention: Director, Military Personnel Division) giving full statement of facts.

WD Circular No. 228
7 June 44
Sect. IV

Travel. Dependents of military personnel not permitted to proceed from U. S. to bases, theaters, or commands outside of U. S., except if bona fide members of A.N.C., W.A.C., A.R.C., or U.S.A., or unless specifically requested by theater or base commander for employment in a capacity necessary to aid war effort.

ASF, Headquarters
Circular No. 175
10 June 44
Part Two, Sect. IV

Neuropsychiatric Patients. Reconditioning program in all A.S.F. hospitals to be extended to include majority of neuropsychiatric patients. Makes provisions re handling of such patients. Refers to TB MED 28, 1 April 1944, and W.D. Cir. No. 164, 1944.

WD Circular No. 233
10 June 44
Sect. V

Rental and Quarters. Officers claiming rental or quarters allowances will show on pay vouchers addresses of dependent wives which reflect their actual whereabouts during pay period. C.O.'s to call attention of personnel claiming such allowances to provisions of AR 35-4220 and decisions of Comptroller General holding: (1) that officers whose dependents live in public quarters are not entitled to rental allowances, and (2) occupancy of a room in Government building by spouse of noncommissioned officer, without expense to him, constitutes public quarters and he is not entitled to quarters allowance.

IMPROVEMENT ON ORTHOPEDIC TABLE

A medical officer with a provisional station hospital (medical battalion) in a Central Pacific area has found the following improvised additions to the portable orthopedic table (Med. Dept. Item No. 7099400) of value:

1. A detachable side rest made of white pine, 5 feet long, 10 inches wide, 1 inch thick, and 6 inches high overall. The distance from the head end of the board to the beginning of the inset for the back rest is 9 inches. The inset which is to allow sliding of the back rest is 11 inches long and $2\frac{1}{2}$ inches deep. The supports for the side rest are made of 2-inch lumber. The metal hooks with eyes for fastening the side rests together at each end are 10 inches long.

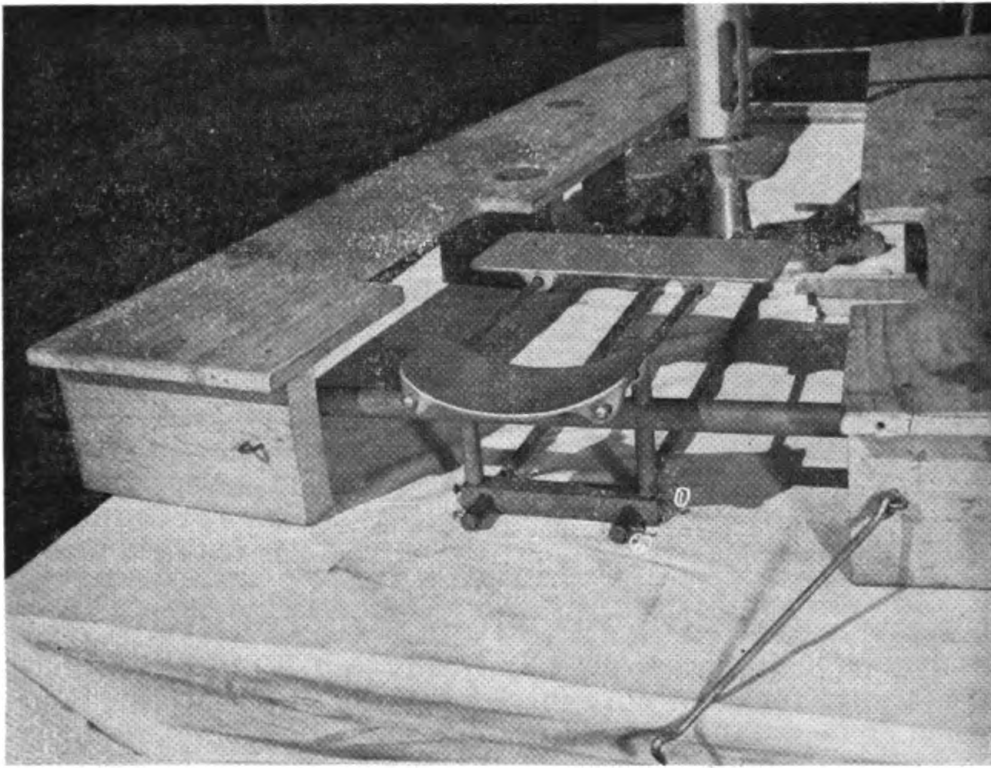


FIGURE 1

2. Changes in headrest assembly. Set screws (substitute wing nut bolt), $\frac{3}{8}$ inch by $\frac{1}{4}$ inch, threaded into each end of cross member, into which fit uprights supporting the head and back supports. Place a pin in hole drilled through the brass collar and parallel rods 1 inch from the head ends of the rods (see figure 1 at 1 and 2).

Signal Corps photograph.

3. Secure the base of the fracture table to the supporting table by means of $\frac{3}{8}$ -inch bolts on either side, passing through the inner angle of the slot into the metal and a corresponding hole drilled through the supporting table top (see 2 in figure 2).

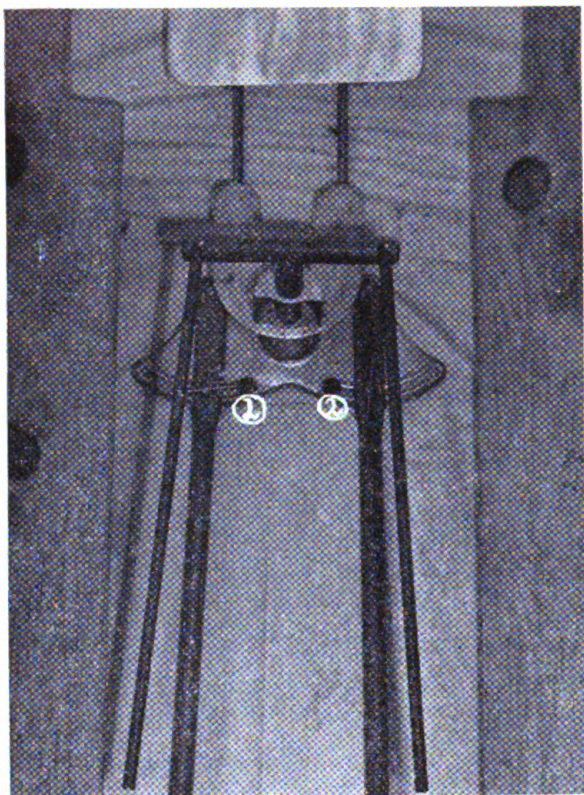


FIGURE 2. Partial view of table from above showing $\frac{3}{8}$ -inch bolts through inner angle of slot in metal base and through supporting table for stability.

The advantages of these additions are support for the patient during anesthesia or before applying traction; the side rests are easily removed after traction is applied; bolting the traction apparatus to the supporting table gives stability; the set screws and removable pins in the headrest assembly give stability and prevent the head and back rests from becoming disengaged while in use; the simplicity of construction of these additions adds to the advantages of this particular portable table over heavier similar orthopedic tables for field use.

MATERIAL FOR STOOL CULTURES

The technique suggested by Hardy and Watt¹ for obtaining material for stool cultures is ideal for the routine examination of food handlers and permits the collection of samples from a large number of individuals in a short time by persons with no special training. First Lieut. R. Finkelstein, Sn.C., reports. The technique comprises the use of a cotton swab on an ordinary applicator stick in a plugged and sterilized test tube. To take the specimen, remove the swab and plug from the tube, dip the swab in sterile water or saline solution, and pass it into the rectum for about one inch. Now reinsert the swab into the test tube and send it to the laboratory where a culture is prepared by rolling it on an S.S. agar plate. The swab can then be destroyed by incineration.

1. Am. J. Pub. Health, May 1944.

AWARD OF LEGION OF MERIT

The Legion of Merit has been awarded to the following Medical Department personnel:

COLONEL WILLIAM S. STONE, M. C., of Washington, D. C. For: Service from January 1941 to July 1943 in initiating and supervising the development of new methods of improvement of sanitation in the Army with particular reference to the development of an effective louse powder for use in the control of typhus. To this and other developments in sanitary procedures of vital importance in the Army he contributed original ideas and intelligent direction. A tireless worker with a tremendous fund of knowledge and experience, he was responsible for some of the most important advances in modern military sanitation.

COLONEL EDWARD J. TRACY, M. C., of Albuquerque, New Mexico. For service as surgeon, 8th Bomber Command, from 11 August 1942 to 6 January 1944. He directed the expansion of medical service for personnel of this command from one group to a large number of groups. Through his foresight and initiative he overcame the problems of sanitation, and care and evacuation of casualties which arose from this rapid expansion during a relatively short period. He instituted the policy of flight surgeons' accompanying their units on operational missions in order that they would better understand the problems of the combat crews under their care. He himself participated in several operational missions in order to gain information and better to evaluate the stress and strain to which combat personnel are subjected. The immediate knowledge gained by him enabled him to make recommendations to the commanding general, 8th Bomber Command, as to the limits imposed by the human factor and as to the policies to be adopted on leaves, passes and furloughs, and related matters affecting morale. He also kept abreast of modern methods of treatment and use and care of protective flying equipment, applying these new methods whenever practicable. The initiative, skill, and sound judgment displayed by him have contributed immeasurably to the combat achievement of the 8th Bomber Command.

MAJOR FRANK A. TODD, Veterinary Corps, U. S. Army, for exceptionally meritorious conduct in the performance of outstanding services as Veterinary Officer, Iceland Base Command, from 16 September 1941 to 1 June 1943. Major Todd was responsible for the establishment and maintenance of proper sanitary standards for the American military personnel in Iceland Base Command. In addition to his assigned duties, Major Todd rendered great assistance to the government and people of Iceland in the fields of animal husbandry, farm conservation, and research in connection with the diseases of Icelandic domestic animals. Through Major Todd's intelligent and enthusiastic efforts, relations between the Icelandic Government and the people of the United States have been greatly enhanced. Entered military service from Iowa.

CAPTAIN HARRY J. ROBERTSON, Veterinary Corps, U. S. Army, for exceptionally meritorious conduct in the performance of outstanding services while serving as a veterinary officer in Iceland Base Command from 3 March 1942 to 31 August 1943. In addition to his military duties, Captain Robertson conducted extensive tests and research in two diseases of domestic animals then prevalent in Iceland, administered preventive inoculations to large numbers of cattle, sheep, and hogs, and advised and assisted Icelandic farmers in many ways. As a result of his efforts, the farmers in Iceland have been greatly benefitted and the internal economy of the country has been materially improved, thereby enhancing the already friendly relationship between Iceland and the United States.

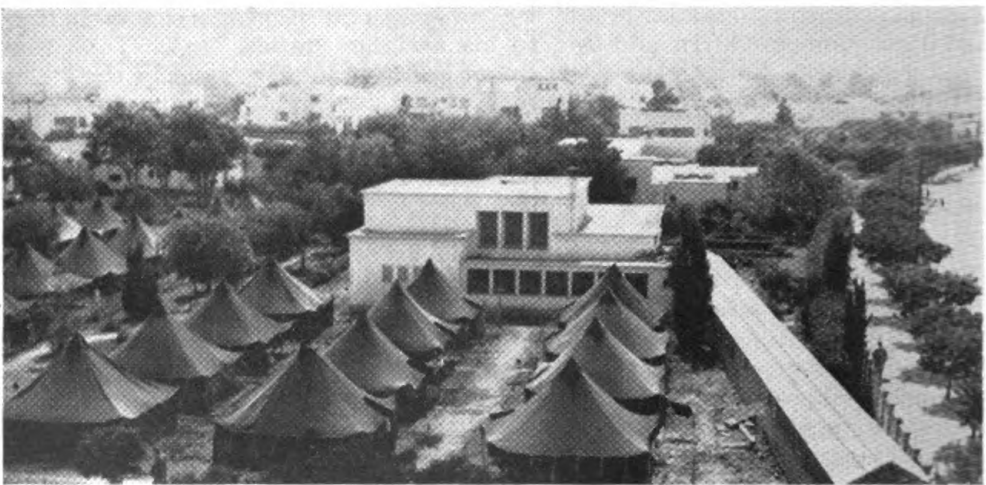
OFFICER CANDIDATE SCHOOL

After a lapse of sixteen months, the Officer Candidate School reopened at Carlisle Barracks, Pennsylvania, late in June with about 250 enlisted men seeking commissions in the Medical Administrative Corps. This select group from all over the United States will be put through seventeen weeks of intensive training in medical administrative work and when commissioned will take over administrative duties, relieving medical and dental officers to carry on professional work.

Thirteen classes had graduated at Carlisle Barracks previous to February 1943 when the M.A.C. School was closed and such training was transferred to the school at Camp Barkeley, Texas. While as yet only two classes have been authorized for training at Carlisle Barracks in the new setup, subsequent classes may be formed.

SANITARY CORPS OFFICERS NEEDED

The Army Medical Department needed, as of 22 July, 500 officers for assignment to the Sanitary Corps to fill vacancies and to relieve physicians and surgeons now serving with the Corps for medical duties. A survey of Army personnel was being made to find qualified entomologists, sanitary engineers, bacteriologists, biochemists, parasitologists, nutritionists, and industrial hygiene engineers. Qualified officers, warrant officers, and enlisted men whose qualifications are not fully used in their present assignments will be considered for duty with the Sanitary Corps. Warrant officers and enlisted men to the extent available will be given direct appointments as officers in the Corps. Qualified civilians may also apply in writing to The Adjutant General, U. S. Army, Washington, D. C., for such commissions.



Buildings taken over for hospitals in French Morocco. Signal Corps photograph.

Correspondence

ANNIVERSARY OF ARMY MEDICAL DEPARTMENT

27 July 1944.

Dear General Kirk:

I feel that this anniversary, the 169th birthday of the Medical Corps, is one of which you, your immediate staff and all officers, nurses, and enlisted men of the Corps should be especially proud, and I hope that you will accept for them and for yourself my very sincere congratulations on a job most efficiently and bravely done. On the combat fronts and at home, you have seen, as I have, the superior performance of the Corps and have witnessed not only its splendid role in battle but also its predominant part in recent medical development and experiment.

The admirable execution of the mission of the Medical Corps has earned the complete confidence of the country in a function of the Army which is naturally closest to the civilian consciousness. We in the Army acknowledge and indorse that confidence and, in addition, add our personal congratulations and praise.

Lieutenant General Brehon B. Somervell,
Commanding, Army Service Forces.

27 July 1944.

To the Officers, Nurses, Enlisted Men, and
Civilian Employees of the Medical Department:

May I join General Somervell, Commanding General of the Army Service Forces, in commending each and every one of you on the 169th Anniversary of the founding of the Medical Department?

You have not only upheld our traditions; you have blazed new trails in the advancement of preventive medicine, in the treatment of the sick, and in the surgical care of our battle casualties. You have performed well your mission of supporting our combat soldiers on the ground and in the air, overseas and at home.

This is not enough! With the decrease in available trained personnel, we must redouble our efforts to see that every sick and wounded soldier receives the best medical care that we who are trained in the healing arts can give, regardless of the personal sacrifices we may be called on to make.

Norman T. Kirk,
Major General, U. S. Army,
The Surgeon General.

27 July 1944.

My dear General Kirk:

It is my pleasure to greet the members of the Medical Department on the 169th anniversary of its founding.

Since the days of the Continental Army, your organization has faithfully and diligently cared for the sick and wounded among the defenders of our country in peacetime and in war. Generations of Americans are in debt to the Medical Department for what it has done for them and their loved ones. Today, in the greatest war of history, your doctors, nurses, administrative and enlisted personnel are showing great courage and devotion to duty on far-flung battle fronts, where their saving of lives and bolstering of morale have contributed importantly to our growing list of victories.

The personnel of the Army Air Forces join with me in greeting you and those who serve with you.

H. H. Arnold,
General, U. S. Army,
Commanding General, Army Air Forces.

HISTORICAL STATEMENT

The Medical Department of the Army had its inception on 27 July 1775 and is now 169 years of age. George Washington had been selected early in 1775 as Commander-in-Chief and certain other staff officers had been authorized. General Washington, having arrived in Cambridge and assumed command, realized that no provision had been made for a medical service, and, on 21 July, he sent the following letter to the President of Congress:

"I have made enquiry into the establishment of the hospital, and find it in a very unsettled condition. There is no principal director, nor any subordination among the Surgeons; of consequence, disputes and contentions have arisen, and must continue until it is reduced to some system. I could wish it was immediately taken into consideration, as the lives and health of both officers and men so much depend on a due regulation of this department."

Congress, however, two days before this letter was written, had passed a resolution, "That a Committee be appointed to consider the method of establishing a hospital." This committee consisting of Robert Treat Paine of Massachusetts, Francis Lewis of New York, and Henry Middleton of South Carolina, reported a bill which was agreed to, on the 27th of July, as follows:

"That for the establishment of an hospital for an army, consisting of twenty thousand men, the following officers and other attendants be appointed, with the following allowance or pay, viz: "

(Here were listed thirty individuals, exclusive of nurses. The first on the list was "One Director general and chief physician, his pay per day, four Dollars.").

EARLY EVENTS IN FRANCE AND ENGLAND

Abstract of a letter from Major General Paul R. Hawley, Chief Surgeon, European Theater of Operations, to Major General Norman T. Kirk, The Surgeon General.

I have just returned from a tour of the First Army in France and I shall try to give you a brief history of events up to the present:

Landings on the westernmost beach did not encounter severe resistance until the troops moved inland. This delay in receiving casualties enabled them to get in some medical installations and the medical service was rather normal. On the eastern beach, they ran into a large German force engaged in maneuvers to repel invasion and casualties were heavy. As you know, one experienced Army surgeon, two young Navy medical officers, and about twenty hospital corps men were present on each LST, providing expert medical service which saved many lives. Hundreds of casualties were carried from where they fell on the beaches to the LST's where they received their first medical care. Perforating wounds of the belly were operated on with splendid results.

The Navy medical service has been superb in this operation. Captain Bowling, the senior naval medical officer with the amphibious force, and I made a trip of inspection together three days before D-day, and I talked with him again yesterday in France. We agreed that, as a joint medical operation, this was a model of cooperation.

The ship's personnel were of the greatest help. Machinists' mates made suction apparatus and other gadgets for the doctors, and members of the crew, when off watch, assisted in feeding and caring for the wounded. The character of surgical work done on the LST's was the very best. These surgeons, exposed constantly to danger, carried on without sleep. They saved many American soldiers.

We also had five small hospital ships, one of which struck a mine but was able to make port. They were manned by British merchant marine crews and their medical complement was one of our hospital trains reinforced with a competent surgeon. They did splendid work but the LST's carried most of the casualties. Provisions for receiving casualties in the United Kingdom were more than adequate. The evacuation officer appointed for each area in which casualties were to be received was given from one to three ambulance companies and from a platoon to two sanitary companies for litter bearers. The sanitary companies had been specially trained in litter bearing and it paid great dividends. These Negroes were as gentle as doves with the casualties and I have never seen better ambulance loading.

At each beach and port where casualties were received, field hospitals, reinforced with surgical teams, were established. The serious cases were admitted directly into these hospitals and given immediate care and treatment. Other cases were sent to transit hospitals within a radius of 20 miles of the beach or port. When cases in holding hospitals became transportable, they also were sent to a transit hospital. The transit hospitals were evacuated daily by hospital trains to general hospitals. In every case, a train arrived at a transit hospital in not more than six hours after the hospital had required evacuation.

The condition of casualties on arrival in the United Kingdom has been surprisingly good. Fractures have been well splinted. Shock has been treated on the LST's and hospital ships, and a patient rarely arrives in shock. Whole blood and plasma have been plentiful in every medical installation, including LST's and hospital carriers. Penicillin has been available for all cases that required it. The freedom of wounds from infection has been a surprise to our surgeons. There has been very little gas gangrene. Whether penicillin is useful in gas gangrene, we do not yet know, but the mortality and loss of limb from gas gangrene in the few cases have been lower than any of our surgeons had ever experienced.

I returned last night from France where I visited a collecting station within a mile and a half of the front line, some eight or ten division clearing stations with their platoons and field hospitals established alongside, and about twelve evacuation hospitals. The platoon of the field hospital for nontransportable cases is doing a splendid job. Their use is practically limited to perforating wounds of the belly and sucking wounds of the chest. However, this 100-bed platoon is too heavy for this purpose. Even in divisions suffering heavy casualties in the assault on Cherbourg, I did not see more than thirty patients in any one of these platoons. The evacuation hospitals were doing a fine job. Occasionally a unit was trying to do too much surgery, but a little experience will cure this tendency. Field hospital platoons were used as holding hospitals at air strips and beaches for cases to be sent to the United Kingdom. Very little delay at these evacuation points was experienced. Many cases were evacuated an hour after arrival and few remained as long as twelve hours. The field hospital platoon is ideally organized for this task.

The Ninth Air Force got in there fast and the first patients were evacuated by air on D-3. It has now almost supplanted all other types of evacuation. Few patients require resuscitation on arrival at the airfield in the United Kingdom and such are held in the holding hospital until they are able to be transported.

At every medical unit visited, I inquired especially of the status of supply. Every answer was to the effect that they had everything they wanted and in ample quantities.

THE HIGHEST STANDARD OF MEDICAL SERVICE

Major General A. W. Kenner, Chief Medical Officer, Supreme Headquarters, Allied Expeditionary Forces, made the following report, slightly abbreviated here, to the Chief of Staff following a tour of inspection on 17 June of various U. S. Army general hospitals in England.

A trainload of 311 battle casualties was received at the 91st General Hospital on D-4 from transit hospitals. Most of these patients had been wounded on D-day. About one-third were fracture cases (there were eight fractured femurs in the group); most of the remaining two-thirds had wounds of various types. Only 2 cases were in serious condition on arrival. About one-half of the patients were ambulatory.

Patients were received in excellent condition; wounds were clean; there was no infection and no indication of gas gangrene. Secondary closure was made on some 50 cases almost immediately. Plaster casts had been well applied. There were no deaths en route and none subsequent to admission. Many have already been released from the hospital. Sulfa or penicillin treatment has been continued in all cases indicated.

A trainload of 250 battle casualties was received at the 97th General Hospital on D-7 from transit hospitals. Most of the patients had been wounded on D-day. Cases consisted of burns, fractures, wounds of various types, and a number of nerve injuries. All are making satisfactory progress.

Patients were received in excellent condition; plaster casts were well applied; surgery had been properly performed and, in some instances, extensive surgery had been done. No patients were in shock. Wounds were clean, and there was no evidence of infection or gas gangrene. No psychoneurotics were received. None died en route or subsequent to admission.

Comment

From reports of medical personnel at these installations and from personal talks with many patients, it was found that, almost without exception, the morale of the wounded was exceedingly high. They were eager to return to battle and there was ample evidence of each man's pride in his own organization. The award of the Purple Heart had been made to all eligible patients who had not received it prior to admission to hospital. Great admiration was expressed for the medical service given on the beaches, LST's, hospital carriers, and ambulance trains.

It is felt that medical service of the highest standard has been given throughout the entire evacuation chain.

MATERIAL FOR MEDICAL HISTORY

1 September 1944.

Dear Fellow Officers:

In accordance with the wishes of the President and the announced policy of the War Department, the Historical Division of my office is now compiling materials for a medical history of this war. This history will not only put into permanent form the contributions of the Medical Department, but it will fulfill the intensely practical purpose of guiding those who, a generation later, may be called on to prepare for and wage another war.

No history can be better than the materials on which it is based. Indeed, unless we obtain full accounts of all Medical Department operations in the field, written by those intimately connected with such operations, the history we write will not be the complete and useful record it should be.

Medical historians of the Civil War and World War I were troubled by the difficulty of obtaining comprehensive reports from those in the field, and the result was that the histories were somewhat marred by the scarcity of source materials. It is desired that such incompleteness shall not cripple our efforts to write a full and graphic history of the present conflict, and it is to enlist your aid that we turn again to you who are now in the field.

The Historical Division has received many valuable reports from you who are theater surgeons and commanding officers of medical units and installations. You have done much already to show our historians how the Medical Department is accomplishing its mission. But these excellent reports have not supplied all the vivid, earthy details we need to fill our history with the breath of life. How can they be improved? As a suggestion, an effective innovation frequently practiced by the historical officers of the General Staff is that of holding critiques in which officers and enlisted men relate their individual experiences. In this way probably you can obtain a more complete, colorful, and integrated account of the work of your command.

Another suggestion is that many officers who do not have command responsibility probably have interesting combat or other experiences to relate. You can, no doubt, furnish details that will add to the color and value of the history. This experience is much desired. If colorful and interesting details are to be preserved, we must depend not only on you who are commanding but also on you who are serving as individuals, for your memories are rich with the experience you have had. Both can make signal contributions to the medical history of this war, because you know what you have done—the medical services you have provided, the problems you have met, the difficulties you have overcome, the expedients you have employed, the successes that have been yours, and the failures you have lamented. Only from you can we learn these experiences and preserve them for those who come after us.

All information based on your own experiences and observations or those of your unit, which shows how Medical Department troops are operating in the field, is grist for our Historical Division's mill. That Division's curiosity for details is insatiable. Your experiences, in an isolated outpost, may seem trivial; but a thousand such experiences, gathered from all theaters of the war, will help us paint a full-bodied picture of what the Medical Department is doing. We are especially interested in

obtaining fuller reports from mobile installations in combat zones.

The commanding officers of aid stations, collecting and clearing stations, portable surgical hospitals, and evacuation hospitals can provide us with valuable historical materials by reporting more fully the following: 1. Location of the installation with reference to the area of combat and the installation from which casualties are evacuated. 2. Camouflage and natural concealment used to protect installations. 3. The promptness and efficiency with which medical treatment is rendered through the various stages of evacuation. 4. Methods employed and difficulties overcome in evacuating casualties, with special reference to speeding up evacuation. 5. Special methods and equipment used in evacuating wounded in amphibious operations, including medical services rendered on board the evacuating craft. 6. How medical supplies are requisitioned, transported, and distributed. 7. Problems caused by terrain, distance, enemy action; and the expedients adopted to solve these problems.

After deciding what experiences in the field you can furnish, you may wonder just how you, as individuals, can do it. Conditions affecting you change rapidly, and we cannot offer precise directions, but here are a few suggestions: 1. Where security regulations permit, maintain a brief day-to-day diary or journal, noting the experiences which you believe would be valuable in a medical history of the war. 2. If a diary is impracticable or not permissible, make mental notes of these experiences for later development in a historical report. 3. When one phase in the operations has ended or when a lull in your activities occurs, write a detailed report of your experience and observations and forward it to your unit commander. He, no doubt, will welcome the opportunity to submit your contribution as an appendix to his annual report (AR 40-1005).

Medical Department officers will be requested by the editors of professional volumes, through the theater surgeon or by the theater surgeon himself, to contribute chapters on professional subjects. Such contributions will be based largely on professional experiences and observations.

The Medical Department is no longer associated with the historical program of the National Research Council. However, individual officers may receive requests from that agency to contribute to the N.R.C. series. Any officer accepting such an assignment will do so as a matter of individual choice and with the understanding that he is in no way discharging an official commitment to the Medical Department historical program.

Additional and better material is required on the military effects of weapons and missiles, the anatomical location of wounds, etc. It is suggested in this connection that you refer to the article on this subject in the Bulletin of the U. S. Army Medical Department, March 1944, page 19.

This communication is not a directive. In the transmission of historical material, you must be governed by the combat situation and the wishes of your immediate superiors. However, within these limitations, you can do much to provide us with the historical material we need, and you may have the satisfaction of knowing that your efforts have enriched the medical history of the war you are fighting.

Norman T. Kirk,
Major General, U. S. Army,
The Surgeon General.

Special Articles

Asymptomatic Neurosyphilis

PAUL A. O'LEARY, M.D., J. E. MOORE, M.D.,
HARRY C. SOLOMON, M.D., JOHN H. STOKES, M.D.,
EVAN THOMAS, M.D.

Asymptomatic neurosyphilis is that manifestation of syphilis which is characterized by abnormal spinal fluid findings but in which there are neither physical signs nor subjective symptoms of invasion or involvement of the central nervous system. When a patient manifests clinical symptoms or signs which denote that the infection has involved the central nervous system, a diagnosis of asymptomatic neurosyphilis is no longer tenable and the diagnosis is then based on the clinical manifestations of involvement of the nervous system. Asymptomatic neurosyphilis may be encountered in any phase of syphilis. It is noted most frequently in early syphilis, in which the incidence approximates 30 percent under older methods of treatment; however, the rate is much lower than this among patients treated by the more recently developed intensive measures. The rate among those untreated or those who have not had the newer intensive treatment for acute syphilis gradually decreases until it reaches an average of 15 percent of patients in whom the infection is of more than four years' duration.

The significance of asymptomatic neurosyphilis lies in these facts: (1) it is the forerunner of clinical neurosyphilis; (2) it is a type of neurosyphilis that frequently responds comparatively satisfactorily to treatment and, in those cases in which treatment is satisfactory, the development of clinical neurosyphilis is thus prevented; (3) the results of repeated examinations of the spinal fluid are the only indicators of the response that the patient is making to treatment; (4) the results of repeated examinations of the spinal fluid also denote the "trend" of the disease in the central nervous system; in other words, they reveal the tendency for the fluid to change to the mild or to the severe (paretic) type; (5) the effect of various schemes of treatment gives an excellent clue to the status of the patient's mechanism of defense against the disease.

It is necessary to understand the significance of each test employed in the examination of the spinal fluid in order to interpret the results of each test intelligently in terms of ther-

Prepared under the auspices of the Sub-Committee on Venereal Diseases of the Committee on Medical Research of the National Research Council.
This is the first of a series of three articles on neurosyphilis.

apeutic effect and prognosis. As the diagnosis of asymptomatic neurosyphilis can be made only by examination of the spinal fluid and by obtaining positive reactions, it seems appropriate at this point to comment briefly on the indications for examining the spinal fluid. The spinal fluid should be withdrawn by the lumbar puncture procedure; the use of cisternal puncture is not acceptable as a routine procedure other than by those especially trained for it. Among patients who are manifesting evidence of acute or early syphilis, the spinal fluid should be examined early during the course of treatment, and, even if a negative report is obtained, the examination should be repeated six to twelve months after completion of treatment and before the patient is dismissed. Among patients who have syphilis of more than four years' duration, the spinal fluid should be examined before treatment is outlined, and also among those patients who have clinically recognizable forms of the disease, such as cardiovascular, hepatic, osseous, or late cutaneous syphilis, the spinal fluid should be tested before or as soon after treatment is started as is practicable. Of course, among patients who have signs or symptoms suggesting involvement of the nervous system, the spinal fluid must be examined before treatment is started. Among patients who have asymptomatic neurosyphilis, the earlier in the course of treatment the spinal fluid is examined, the easier it will be to interpret the subsequent changes in the various tests, thus observing the trend and response of the spinal fluid to treatment. Accordingly, among patients who have asymptomatic neurosyphilis, re-examinations of the spinal fluid must be done at intervals of about six months if the significance of the changes in the abnormality of the spinal fluid is to be interpreted accurately.

EXAMINATION OF THE SPINAL FLUID¹

An adequate examination of the spinal fluid should consist of the following five tests:

1. *Cell count.* This should be determined immediately after the fluid is withdrawn. If the fluid is sent to some distant laboratory, the cell count may be inaccurate in that within twelve hours there may be a 50 percent reduction of the number of the cells. If several hours or more must elapse before making the cell count, keep the fluid in an icebox and shake well before examining. The normal spinal fluid may contain from 1 to 8 lymphocytes per cubic millimeter; however, a count of 6 to 8 lymphocytes per cubic millimeter is considered as bordering on the abnormal.

1. The presence of blood in the spinal fluid may affect the results of any or all of the tests depending on the amount present and on whether the blood contains reagin. Even very minute amounts of blood may give rise to reactions in the colloidal gold tests. Therefore, if the presence of blood is demonstrated or is suspected, the tests on this sample of spinal fluid must be interpreted with great caution and in most instances a new spinal tap should be made several days to two weeks later.

The presence of more than 8 lymphocytes per cubic millimeter is considered abnormal. The presence of large lymphocytes, plasma cells, or polymorphonuclear leukocytes not only is associated with a positive spinal fluid but indicates a severe degree of abnormality. Red blood cells in the fluid are usually due to the trauma produced by the needle.

2. *Complement-fixation test* (quantitative desirable). This test, performed by using the recommended Army techniques, is the second important examination.

3. *Colloidal gold test*. The significance of this test increases with the persistence of the significant "curves" on repeated examinations. This is illustrated well in the interpretation of the zone 1, or paretic, type of curve (5555432210).² One such paretic type of curve does not mean that the patient has general paresis or that it necessarily will develop. However, if on repeated examinations of the fluid the gold test shows a persistence of the zone 1 reaction and the other tests of the spinal fluid also give positive results, the likelihood that dementia paralytica is impending increases with each report. The zone 2, or syphilitic, type of curve (0002332000) is found among patients who have tabes dorsalis, diffuse meningovascular neurosyphilis, and sometimes in cases of asymptomatic neurosyphilis. A normal colloidal gold curve may consist of all zeros or may show a slight increase in the middle group of figures, such as 0001221000.

4. *Estimation of total protein*. The upper limit of normal with the usually accepted tests is 40 mg. per 100 cc. of spinal fluid. The estimates of globulin and protein alone do not indicate the type or degree of involvement of the central nervous system but merely denote an abnormality of the spinal fluid. However, a persistently elevated total protein in the absence of other organic disease of the central nervous system may denote early involvement of the nervous system.

5. *Estimation of globulin*. A normal amount is interpreted as negative (Nonne-Apelt or Pandy).

In cases of asymptomatic neurosyphilis the spinal fluid findings may be of varying degrees, and these five tests, in various combinations, create a pattern that may be interpreted as indicating a mild, moderate, or severe degree of invasion of the central nervous system. The three grades of abnormalities of the spinal fluid are illustrated in table I.

SIGNIFICANCE OF SPINAL FLUID FINDINGS IN PROGNOSIS AND TREATMENT

Comment has already been made that asymptomatic neurosyphilis is characterized by a positive spinal fluid and an absence of clinical signs of involvement of the central nervous system. In spite of the absence of clinical manifestations, it is

2. Among patients who have multiple sclerosis, a zone 1 gold curve, a pleocytosis of 8 to 40 cells per cubic millimeter, an increase of the protein and globulin content, and a negative flocculation or complement-fixation reaction may be found.

TABLE I

General classification of spinal fluids according to the degree of abnormality observed on examination by each of the five indicated tests

Group	Cells per cubic millimeter	Colloidal gold curve	Serologic reaction	Globulin	Protein, mg. per 100 cc.
Group I or mild*	8 to 30	0000000000 to 0003330000	Negative	Negative or positive	25-50
Group II or moderate†	20-100	0003330000 to 0245542000	Doubtful, positive, or strongly positive	Positive	40-100
Group III or severe‡ (paretic)	10-100	5555543210	Strongly positive	Positive	75-150

*The **mild** group includes fluids in which the number of cells and content of globulin and protein may be increased; the complement-fixation reaction is negative and the colloidal gold curve may be indeterminate or positive. If positive, the curve is usually of the syphilitic zone type.

†The **moderate** group includes fluids in which the cells number 20 or more per cubic millimeter, the complement-fixation reaction is positive or strongly positive, and the colloidal curve is of the tabetic or indeterminate type. The estimate of the globulin is positive and the estimate of protein shows an increase to an average of 60 mg. per 100 cc. Fluids falling just short of the requirements of the severe group are also included in this group.

‡The **severe** group includes those fluids that have the so-called paretic formula, that is, marked excess of globulin, content of protein averaging about 100 mg. per 100 cc., a strongly positive complement-fixation reaction (0.2 cc. or less), and the type of colloidal curves indicating dementia paralytica. The number of cells is decidedly increased, and in addition to the small lymphocytes, large lymphocytes and polymorphonuclear leukocytes may be present.

possible to recognize from the spinal fluid findings that different types of neurosyphilis are impending. It is not possible to make such deductions, however, from one but rather from successive examinations of the spinal fluid. For example, in a case of asymptomatic neurosyphilis, the paretic type of formula may be reported in the spinal fluid at the time of the first examination. If, after six months of treatment, the paretic features of the fluid persist, this finding then assumes significant proportions and, if this paretic formula remains, it is convincing evidence that the patient has a resistant type of infection, that the treatment given him has been inadequate, and that a change of the therapeutic program is warranted. Another type of spinal fluid report is noted among the patients who have asymptomatic neurosyphilis, who likewise manifest a paretic trend in the original test of the spinal fluid, but who after six months of treatment no longer have the paretic features in the spinal fluid and in whom negative results may be obtained on examination after the second period of six months of treatment.

Studies of spinal fluid similar to these two examples, which denote the trend of changes in the spinal fluid while the patient is under treatment, demonstrate the outstanding value of such tests. If the trend of change in the fluid is from the parietic or group III toward the less severe types of involvement, the inference is that the program of treatment is probably adequate; but if the group III features persist or if the fluid relapses toward the severe type after a rest from treatment, it denotes that a change of the therapeutic program should be considered. It is recommended that, for patients who have the severe and persistent type of abnormalities of the spinal fluid, repeated neuropsychiatric examinations be done at least every three months.

The results from treatment are best in the cases of asymptomatic neurosyphilis in which the abnormalities of the spinal fluid are the least severe and in those in which the patient has had the disease for only a short time. The results from chemotherapy are best in the cases of early asymptomatic neurosyphilis in which syphilis has been present for two years or less, while in those in which the disease has been present longer, chemotherapy is frequently not capable of reversing the spinal fluid findings to normal and in such cases the early use of fever therapy is indicated. When the group III formula is encountered in examination of the spinal fluid, it is usually necessary immediately to adopt more strenuous therapeutic programs, such as fever therapy, and frequently to employ chemotherapy after fever therapy in order to reverse the reactions to negative.

In some cases of asymptomatic neurosyphilis, serologic negativity occurs spontaneously, and, although the incidence of these cases is not known, they are encountered often enough to emphasize the fact that the forces of immunity among certain patients are mustered early in the course of the disease without the aid of treatment and overcome the invasion of the nervous system completely. The development of an immune response plus modern treatment prevents clinical neurosyphilis in a high proportion of cases.

The treatment of asymptomatic neurosyphilis varies, depending on the duration of syphilis, the type of the spinal fluid pattern, and the amount and type of treatment the patient has received previously. The best therapeutic results are observed in those who have had syphilis two years or less and who have the mild or moderate type (group I or II) of spinal fluid pattern, while the less favorable results, as evidenced by clinical progression of the disease or persistence of the positive reactions of the spinal fluid or both, are noted in patients who have had syphilis for four years or more, who have the severe type (grade III) of spinal fluid, and who as a rule have had less than the minimal required amount of treatment during the early phase of the infection.

The treatment of asymptomatic neurosyphilis is described in the third paper of this series. Whatever treatment system is employed, its results should be checked by re-examinations of the spinal fluid at intervals not greater than six months.

Observation for twenty years of a group of patients with asymptomatic neurosyphilis and a study of their clinical progressions toward tabes dorsalis, general paresis, and other types of clinical neurosyphilis indicate that the patients who had mildly positive spinal fluids showed the lowest incidence of clinical progression; those who had the so-called parietic formula in the spinal fluid gave evidence of clinical progression more than four times as frequently. In the study of the influence of the amount of treatment, it was found that those who received small amounts, that is, less than ten injections of an arsphenamine, showed an incidence of clinical progression three times greater than those who received more than twenty injections of an arsenical preparation and a heavy metal.

The serologic reaction of the blood is not an indication of the status of the spinal fluid. In some cases of asymptomatic neurosyphilis the serologic reactions of the blood may be negative while the spinal fluids are strongly positive. This finding stresses the need for examining the spinal fluid irrespective of the status of the serologic conditions of the blood of patients who have a history of syphilis. Patients under treatment for syphilis should not discontinue treatment, even if their serologic reactions of the blood are negative, unless the spinal fluid has been examined and found also to be negative. Among patients under treatment for early syphilis, a relapse of the blood reactions from negative to positive is accompanied by positive findings in the spinal fluid in many of the cases. Another significant maxim regarding asymptomatic neurosyphilis is that if a positive spinal fluid has not developed by the fourth year of the disease the patient can be assured that neurosyphilis will probably not develop in the years to come.

A frequent explanation for "Wassermann-fastness" of the blood (seroresistance) may be found in the examination of the spinal fluids of such patients. Many patients thought by routine methods to be seroresistant have positive spinal fluids. In other words, these persistently positive serologic reactions in the blood are often due to the presence of asymptomatic neurosyphilis.

Even if the modern treatment of syphilis does not produce a "cure" in all cases, it does decrease materially the incidence of the late complications of the disease. The competent use of modern treatment in early syphilis has reduced the incidence of asymptomatic neurosyphilis to less than 2 percent, as compared with an incidence of 30 percent following the use of irregular and haphazard systems of treatment.

Clinical Studies on Microfilarial Periodicity in War Dogs

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The periodicity of microfilariae in the peripheral circulation of infested men and animals has intrigued scientists for many years and now has become of pressing importance. Already this war has demonstrated the significant part these nematodes will play in the lives of the men who serve in the Pacific war theater. Of less moment is the high percentage of war dogs infested with heartworm (*Dirofilaria immitis*) within continental United States since 1942. Nocturnal periodicity of the microfilariae is frequently reported and as frequently denied in our texts. Underwood and Wright¹ reported a nocturnal microfilarial periodicity in a single twenty-four hour study on two dogs. Hinman² found that the daily maximum count varied between 11 p.m. and 3 a.m. and the daily minimum count occurred between 3 a.m. and 7 a.m. He depicted a chart showing the rise in number of microfilariae in the peripheral circulation as well under way at 5 p.m., increasing sharply between 7 and 9 p.m. and increasing slightly after that to a peak around midnight. Manson, Sonsino, Kosugo, and Hansen are quoted³ as stating that microfilariae are found in the peripheral vessels mainly or exclusively between 6 and 8 p.m. Dibbell⁴ has noted a peak count for diagnostic purposes in the "evening."

In war dogs under training at this center and especially those returned here from east coastal areas, the diagnosis of filariasis became an acute problem. It was noticed that of dogs which had seen service during 1943 and were returned late that year or early in 1944, the blood was often negative on re-entry here and some weeks or months later microfilariae were found

From the Front Royal Quartermaster Depot (Remount).

1. Underwood, P. C., and Wright, W. H.: Observations on the Periodicity of *Dirofilaria immitis* Larvae in the Peripheral Blood of Dogs, *Proc. Helminth. Soc. Wash., Jour. Parasit.*, 20:113, Dec. 1933.

2. Hinman, E. Harold: Studies on the Dog Heartworm, *Dirofilaria immitis*, with Special Reference to Filarial Periodicity., *Am. J. Trop. M.*, 15:371-383, May 1935.

3. Hutyra, F., Marek, J., and Manninger, R.: *Special Pathology and Therapeutics of the Diseases of Domestic Animals*, vol. 3, page 155. Chicago: Alexander Eger.

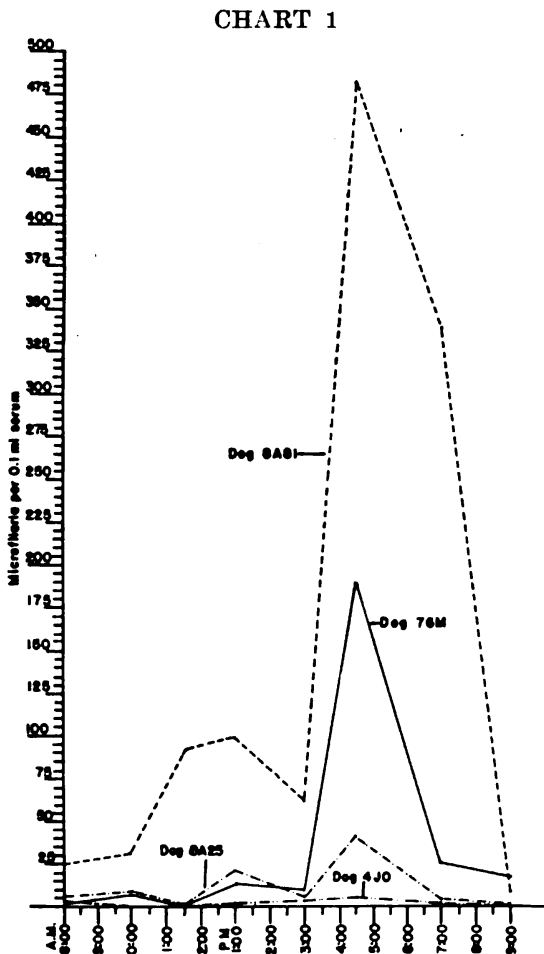
4. Dibbell, E. B., Baltimore, Personal communication.

on re-examination of venous blood. Few of these dogs came to our attention because of symptoms which could be attributed to heartworms. They were hospitalized because of other illnesses or injury.

The method of examination for the demonstration of filariae in dogs admitted to this center had consisted of withdrawing 2 cc. of blood from the radial vein, then mixing it with 5 cc. of a 2 percent solution of acetic acid. The resultant sediment was examined on the following day for dead microfilariae. Early in February of this year the method was changed to one considered less liable to error. Blood was withdrawn in 2 cc. amounts as

before and placed in a marked tube. The clear serum was examined for live microfilariae on the following day or later in the same day. This method is more accurate and better suited to our problem for the following reasons: (1) examination of wet microscopic preparations for motile microfilariae is far less tiring to the eyes than is looking for killed ones; thus human error is partly eliminated; (2) in the whole-blood acetic-acid method, a sludge sometimes forms on the bottom of the tube which adds unreliability to the process.

Later when it was found that in spite of improvement in the method of examination, many dogs which had previously passed from one to several negative tests were positive on re-examination, two suppositions were open to us: (1) that the incubation period (the time from infestation until microfilariae appeared in

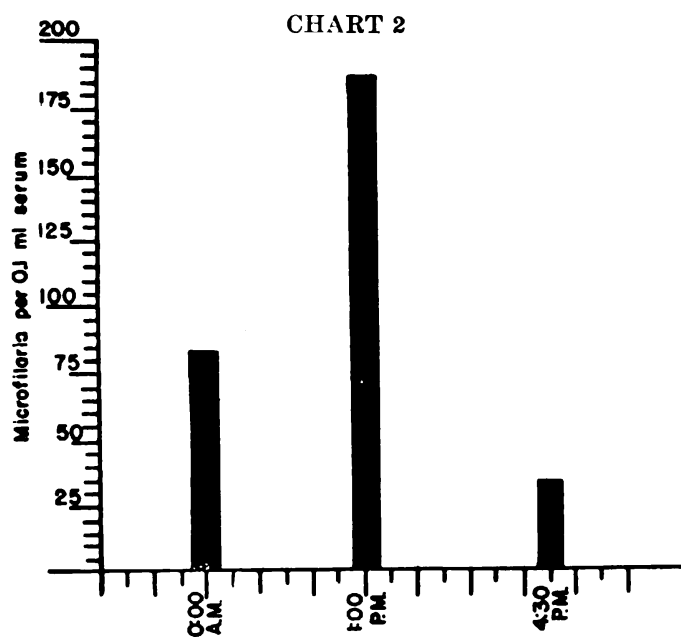


Variation in number of microfilariae in 0.1 cc. of serum from blood from the radial veins of four dogs.

the blood) was many months long, causing dogs infested in the summer of 1943 to begin to have circulating microfilariae not earlier than February of 1944, or (2) that microfilarial periodicity accounted for the false negative examinations. Both suppositions were found to contribute to the difficulty of diagnosis.

METHOD OF COUNTING MICROFILARIAE

Since the problem was one of diagnosing filariasis in any degree, it was deemed necessary to evolve a method of counting microfilariae which would be accurate in early and often light infestations. The method used by Hinman² was considered inaccurate for our purpose, since among 22 dogs routinely discovered by the serum method, only 12 showed microfilariae in a direct wet blood preparation. Data are included with this report to show that the number of microfilariae in the peripheral vessels is related not only to the periodicity factor and to the number of female filariae present, but also to the length of time over which the infestation had existed. Since all the dogs had been examined at the time of original entry into the Army and on each return to this center, the status of their infestation could be traced to a known period within the limits of reasonable conjecture at



Varied pattern of microfilarial periodicity in seven dogs which received their only daily feeding at 11 a. m.

least. Our method of counting is conceded open to some error but we believe it is sufficiently accurate to give valuable clinical information. Two cc. of blood are withdrawn from the radial vein (or from other veins as indicated) and placed in a 2-dram vial which is then slanted to facilitate clotting. Clotting takes place in from two to twelve hours depending on temperature and on the inherent quality of the blood to clot. When clotting is complete, all the clear serum is drawn into a 1-cc. syringe which is inverted several times to ensure mixing. One-tenth cc. of the serum is then spread thinly on a slide and all the microfilariae are counted. Thus prepared, the microfilariae are still motile but not sufficiently so that they can move any distance and thus change fields and alter the count. All results given herein are in terms of the number of microfilariae per 0.1 cc. of serum thus collected and prepared.

THE MICROFILARIA IN VITRO

Blood and serum samples were kept at room temperature for varying periods during this clinical study. Live microfilariae were found eight days after the blood had been collected

during cool weather when room temperature varied between 40° F. at night to 65° during the day. During hot weather, dead microfilariae were found in the serum forty-eight hours (or slightly less) after withdrawal of the blood. It is recommended that samples be refrigerated after clotting when the weather is hot. Samples should be allowed to warm up a bit before counting is attempted, to restore motility to the parasites.

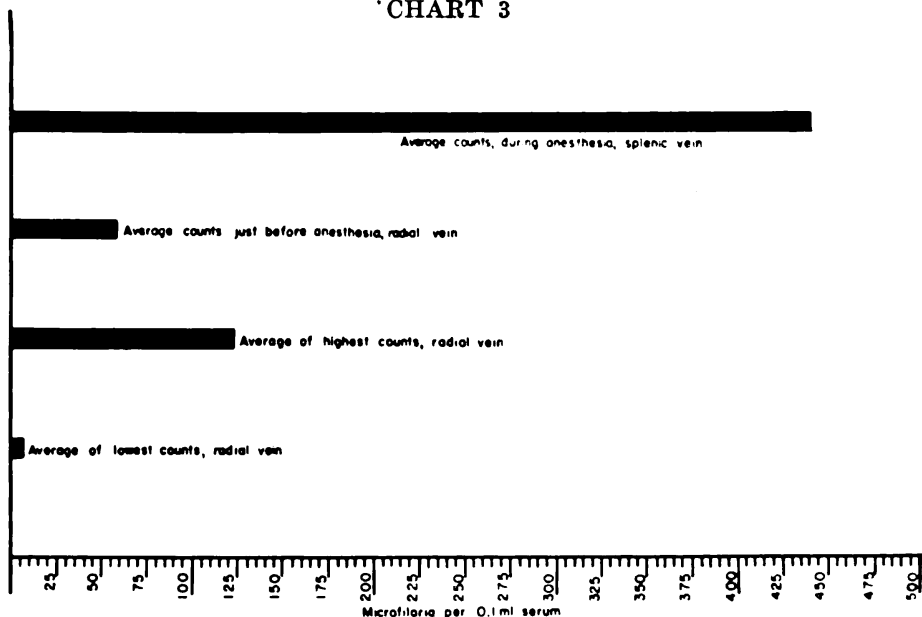
PERIODICITY OF MICROFILARIA

Four dogs were selected at random from known infested dogs which were hospitalized, one for "enteritis," one for a dog bite wound, one for cellulitis which followed venipuncture, and one for emaciation of unknown cause. All dogs except the latter were in good physical condition and none showed clinical symptoms which could be attributed to filariasis. A Doberman pinscher admitted for emaciation, when autopsied, did not give evidence that the emaciation was directly related to the filarial infestation. Supporting this contention is the fact that the majority of infested dogs were in good physical condition in spite of moderately heavy infestation in many of them. Heavily coated dogs were infested equally with short-coated species like the Doberman pinscher. Of 54 dogs which received close study, 34 were long-coated, principally shepherds, and 20 were short-coated, mostly Doberman pinschers.

The periodicity pattern set by the dogs shown in chart 1 is much the same in all of the dogs. All reached a high point at 4:30 p.m. and dropped off after that time. Four of them dropped sharply and all but one was lower at 9 p.m. than at 8 a.m. Strangely, every dog had a lower count at 3 p.m. than at 1 p.m. When this series of counts was made, it was hospital practice to feed a small meal at 11 a.m. consisting of cooked oatmeal or rice and evaporated milk (rejected cans). The main meal of horse meat and dry dog food was fed at 3 p.m. just before the 3 o'clock counts were made. It may be seen that the pattern does not coincide with that shown by Underwood and Wright¹ or by Hinman² or that quoted by Hutyra, Marek, and Manninger.³ The last authority cited evidence of a peak between 6 and 8 p.m. which is rather close to our findings. Later experiments with an altered routine of feeding suggest that our findings may have varied from those of the last authors cited by virtue of the dog's routine, particularly the feeding. The fact that such a variety of patterns has been described by several workers suggests the risk of applying the findings of any of them to a particular group of dogs whose routine and time of feeding may still alter the pattern. Particularly hazardous to the clinical diagnosis of this disease is the observation that out of thirty-two counts made on these four dogs in one day, no microfilariae were found in the sera on six counts. One dog had a count of 1 at 8 a.m. and a negative count at 11:30 a.m., and yet had 189 microfilaria per 0.1 cc. at 4:30 p.m. Another dog had a high count of 482 at 4:30 p.m. which dropped to 10 at 9 p.m.

In creating an altered routine of feeding, the dogs were fed at 11 a.m. for two days and bled on the third day of this regimen. Considered individually the periodicity did not follow a constant pattern; in fact, the most constant factor was a definite change from the pattern of chart 1. It may be that had the regimen been continued longer a more constant pattern might have resulted.

CHART 3



A composite average of five dogs, showing average low count of blood from the radial veins, the average count from the radial vein immediately before anesthesia, and the average count from the spleen itself. It is apparent that the spleen harbors microfilariae in greater concentration than is found in blood in the peripheral veins.

EFFECTS OF EXERCISE

To ascertain the effect of exercise on the microfilarial count, two dogs were selected and samples of blood drawn at intervals before exercise, immediately after exercise, and after a period of rest. The results follow:

	Dog 76M	Dog 4JO
12:45 p.m.	23	12
Exercise by running until 1:30 p.m. ..	26	13
Rest period until 2:45 p.m.	30	13
Rest period until 4:15 p.m.	20	12

No significant changes took place. These dogs were being fed at 11 a.m. on the day of these counts.

MICROFILARIAL CONCENTRATION IN THE SPLEEN

An attempt was made to deduce whether physiologic variations in the size of the spleen might cause variation in the number of microfilariae in the peripheral blood vessels. Manson⁵ proved that a concentration of the microparasites existed in the

5. Manson, P.: The Filaria Sanguinis Hominis. London: H. K. Lewis, 1883.

visceral circulation of the dog and that it was chiefly in the pulmonary vessels. Since authority existed at the time for the destruction of dogs with filariasis, several dogs were anesthetized with pentobarbital sodium prior to euthanasia and blood samples taken from the splenic vessels and from the spleen. Dog T241, on which many daily counts had been made, was anesthetized and the following counts obtained: heart, 8 per 0.1 cc. of serum; splenic vein, 41 per 0.1 cc. of serum; splenic artery, 6 per 0.1 cc. of serum. The highest previous count from this dog of 14 tests had been 15 microfilariae and the average of all counts had been 7.5 per 0.1 cc. of serum from the radial or jugular veins. These figures suggested that the spleen may act as a reservoir for the microparasites. It may be said of Manson's⁵ negative findings on the spleen in comparison to other viscera, that the spleen in death is quite small in comparison to its size under anesthesia or when radiographed during life. The senior author is inclined to believe that the spleen is larger during pentobarbital anesthesia than when ether is given. This phenomenon may be in no way directly related to the drug used. Fear, excitement, and struggling during the administration of an inhalation anesthetic may account for the difference.

EFFECTS OF CLAMPING THE SPLENIC ARTERY

A dog which was to be destroyed for filariasis was subjected to counts during a day to establish a normal range and pattern. Two days later the subject was fully anesthetized. A complete record of microfilarial counts was made before anesthesia, just before operation, and after the splenic artery was clamped. The results follow:

Dog B17

May 8, at 9:45 a.m. radial vein, 22 microfilariae
 10:30 a.m. radial vein, 19 microfilariae
 Fed at 3 o'clock
 4:30 p.m. radial vein, 205 microfilariae

May 10, before anesthesia, radial vein — 1:15 p.m., 50 microfilariae
 after anesthesia, radial vein — 1:30 31 "
 jugular vein — 1:32 75 "
 saphenous vein — 1:34 103 "
 splenic vein — 1:40 200 "

(Splenic artery clamped)

radial vein — 1:50 142 "
 jugular vein — 1:52 191 "
 saphenous vein — 1:55 181 "
 splenic vein — 1:58 188 "

Results similar to these were obtained in two other dogs in which the bleedings were not so complete. They did establish that there is an increase in the microfilarial count in the peripheral vessels after ligation of the splenic artery. Dog B17 had 7 female and 4 male filariae in the right side of the heart or pulmonary vessels when an autopsy was performed.

CHART 4

CHART 4

DOG NO.	STATE OF ORIGIN	NUMBER OF MONTHS OF SERVICE																Microfilaria per 0.1 ml serum	Adult filaria at autopsy		
		AT RECEPTION CENTER								AT STATION											
		7	6	5	4	3	2	1		1	2	3	4	5	6	7	8				
1	Washington	San Carlos								Alabama (Gulf)					N	P		1	—		
2	Michigan	Fort Robinson								Delaware (Coast)							N	17	—		
3	Illinois	Fort Robinson								Delaware (Coast)								600	—		
4	Indiana	Fort Robinson								Delaware (Coast)							N P	504	—		
5	Indiana	Front Royal								Florida (Coast)								6	—		
6	Missouri	Fort Robinson								Florida (Coast)							N P	101	—		
7	Maryland	Front Royal								Florida (Coast)								53	—		
8	New York	Front Royal								Florida (Coast)								9	—		
9	New York	Front Royal								Florida (Coast)							N P	43	—		
10	California	San Carlos								Florida (Coast)							N	40	—		
11	Texas	Front Royal								Florida (Coast)							N P	68	—		
12	Missouri	Front Royal								Georgia (Coast)							N	1	—		
13	Maryland	Front Royal								Iceland								700	—		
14	Massachusetts	Cat Island								Mississippi (Gulf)								4	—		
15	California	San Carlos								Mississippi (Gulf)							N P	30	—		
16	Wisconsin	Fort Robinson								New Jersey (Coast)							N	3	—		
17	Texas	Front Royal								New Jersey (Coast)							P	5	—		
18	Connecticut	Front Royal								New Jersey (Coast)							N	675	—		
19	Indiana	Fort Robinson								New Jersey (Coast)							N P	406	—		
20	Unknown	Elkin's Park								New Jersey (Coast)							N P	3	—		
21	New Jersey	Front Royal								New Jersey (Coast)							N P	58	—		
22	Virginia	Elkin's Park								New Jersey (Coast)							N P	5	—		
23	Unknown	Elkin's Park								New Jersey							N P	13	—		
24	Maryland	Front Royal								North Carolina							N P	21	—		
25	Pennsylvania	Fort Robinson								North Carolina (Coast)							P	605	—		
26	Illinois	Fort Robinson								South Carolina (Coast)								1140	—		
27	Illinois	Front Royal								South Carolina							N P	119	—		
28	Indiana	Front Royal								Virginia (Coast)							N P	62	—		
29	Massachusetts	Front Royal								Virginia (Coast)							N P	13	—		
30	Ohio	Front Royal								Virginia (Coast)							N P	75	—		
31	Massachusetts	Front Royal								Virginia (Coast)							N P	380	—		
32	New Jersey	Front Royal								Virginia (Coast)							P	1	—		
33	Massachusetts	Front Royal								Virginia (Coast)							N P	11	—		
34	Connecticut	Elkin's Park								Virginia (Coast)							N P	8	—		
35	Pennsylvania	Front Royal								Virginia (Coast)							N P	90	—		
36	New Jersey	Front Royal								Virginia (Coast)							N P	13	—		
37	Georgia	Fort Belvoir								Virginia							P	41	—		
38	Alabama	Front Royal								Virginia							N P	600	—		
39	Indiana	Front Royal								Virginia							P	41	—		
40	Maryland	Front Royal								Virginia							P	482	—		
41	Texas	Front Royal								Virginia							N P	575	—		
42	Maryland	Front Royal								Virginia							P	2	—		
43	Maryland	Front Royal								Virginia							P	91	—		
44	Kentucky	Front Royal								Virginia							P	3	—		

Army records of forty-four dogs infested with filariasis. The letter *N* indicates the last date on which a negative examination of the blood was made. Other negative examinations may have been completed in the interim at the stations of service of many of the dogs and many such tests were made at this center. The first positive examination (*P* in the chart) and the periods of elapsed time shown indicate that *Dirofilaria immitis* has a long period of incubation. Possibly some of the dogs, particularly those originating in southern states, were infested when inducted, but the time of infestation in most cases can be considered as beginning when the dog began service in an area known to be favorable to the transmission of filariasis. *M* indicates male and *F* female filariae. In three instances adult filariae were not found at autopsy. When figures are not shown in this column, no autopsy was done, the animal being treated for the disease.

EFFECTS OF EPINEPHRINE ON THE MICROFILARIAL COUNT

Since the splenic vessels harbor microfilariae in greater concentration than does the peripheral circulation, an attempt was made to determine the effect of injecting a drug known to cause a reduction in the volume of the spleen. On five occasions dogs were given intravenous injections of 1 to 1.5 cc. of a 1:1,000 solution of epinephrine hydrochloride (not for intravenous use) which was diluted with 5 cc. of normal saline solution before injection. An average count of the five dogs immediately before injection was 8 per 0.1 cc. of serum. This rose to 27.5 in from three to five minutes after injection, fell to 22.5 at ten to fifteen minutes, and returned to very near the starting point in thirty minutes.

EFFECTS OF SPLENECTOMY

The spleen was removed surgically from two dogs with filariasis. No difficulty was experienced during the operation or postoperatively from the filariae in the heart or lungs. After splenectomy and recovery from the operation, daily microfilarial counts were done on both dogs to determine the effect on the periodicity pattern. An afternoon rise took place in both dogs, reaching a level higher than had been noted before. One dog showed a count three times higher than any previous count during the late afternoon rise. This elevation reached 605 microfilariae at 4 p.m., having been 79 at 3:30 p.m. Not only was the peak at a higher level than had been detected previously but the rise was sharper.

The effect of the injection of epinephrine on the splenectomized dogs was irregular and indicated that the rise in circulating microfilariae in normal dogs following this injection was probably at least partially due to contraction of the spleen. Three minutes after the injection of 1 cc. of a 1:1,000 solution, diluted with normal saline, the microfilarial count was trebled in the radial vein of one dog. When this experiment was repeated on the same dog on two additional days, no effect was seen on the count in blood from the radial vein.

CONCLUSIONS

1. When microfilarial counts were done periodically throughout the day on four dogs, the high point was reached in all of them at 4:30 p.m.; it was declining at 7, reaching the low point at 9 p.m. This curve of periodicity was altered by changing the feeding routine of the dogs.

2. A greater concentration of microfilariae was found in the spleen and splenic vein than in the peripheral circulation.

3. The number of microfilariae in the peripheral circulation could be trebled in three minutes by an intravenous dose of epinephrine; the numbers were also markedly increased by clamping the splenic artery and allowing the spleen to drain out.

4. Long-coated and short-coated dogs are infested equally.

5. The time from the exposure of an adult dog to the source of infestation until microfilariae appeared in the peripheral circulation averaged more than eight months.

War Wounds of the Chest

At the onset of World War I, thoracic surgery lagged far behind other fields of surgery. The fear and hesitancy of entering the chest acted as a barrier to the application of surgical principles that had been generally accepted for wounds in other regions of the body. This barrier was further strengthened by the conservative views acquired in the South African War which were based on injuries of a much less severe nature than those encountered in France. The high mortality finally forced a break-down of these barriers and compelled a bolder approach to the problems which placed thoracic surgery on an entirely different plane of thought. Many of the procedures finally adopted at the close of the last war had been attempted by surgeons in bygone wars and again in the present war there has been some disregard of lessons learned in the last war.

The information presented here on incidence, mortality, and types of war wounds of the chest in the American forces has been obtained from sources available to The Surgeon General's Office, including reports from consultants, hospitals, field units, and medical officers.

INCIDENCE

Wounds of the chest comprise a significant proportion of war injuries. In the last world war no figures on the total number of chest injuries, i.e., those among the "killed in action" as well as the wounded, were collected in either the British or American service. An effort has been made to correct this deficiency in this war, and preliminary reports show an incidence of about 27 percent. From these fragmentary observations, it appears that the chest is involved in about one-fourth to one-third of the total killed. This is supported by certain observations of Longmore and statistical data on wounds in the American Civil War which even today are the best available for this purpose. Longmore estimated the relative amounts of area presented by the divisions of the body and gave as the mean of these measurements the following percentages of the whole target area of the body: head, face, and neck, 8.51 percent, trunk, 28.91 percent, upper extremity, 21.14 percent, and lower extremity, 41.41 percent. Exposure of these regions differs with conditions and types of combat and the relative degrees of protection afforded by position, terrain, wearing apparel, fox-holes, and trenches.

Condensation of an article prepared in the Surgery Division of The Surgeon General's Office by Colonel B. Noland Carter, M. C., and Lieut. Colonel Michael E. DeBakey, M. C. The complete paper will appear in the *Journal of Thoracic Surgery*.

It is evident that chest wounds comprise from one-fourth to one-third of the casualties. The high proportion of these that are fatal on the battlefield, however, reduces their relative incidence among the wounded that are admitted to medical units. In a statistical analysis of about 20,000 American wounded, chest wounds in the present war comprised a little over 8 percent of the cases which is almost identical with the figure reported by the Russians. Despite the increased effectiveness and wounding potentiality of weapons, the incidence of chest wounds, among the wounded admitted to medical units at least, has remained about the same in the various wars from 1855 to the present war. Chest wounds in warfare occur in a ratio of about one to four among those killed in battle and about one to twelve among the wounded.

CHARACTER OF WOUNDS

Bullets are more liable to produce sharply localized penetrating wounds or simple through-and-through wounds with a small puncture-like point of entry and a somewhat larger exit wound. Except when the bullet strikes at that period in its trajectory characterized by an exaggerated wobble around its axis or when it strikes a rib causing comminution, bullet wounds are associated with little contamination and with minimal tissue damage and cardiorespiratory disturbances. Many of these simple penetrating wounds need little more than a sterile dressing, supportive measure, and conservative management. Fragments of high explosive shell, bombs, and mines tend to cause greater destruction of tissue, to carry in fragments of bone and of clothing, and to be often retained. Hemorrhage, shock, and cardiorespiratory disturbances are more common and severe. Operative intervention is therefore more frequently necessary and usually indicated earlier. The difficulties in management of these wounds and the mortality and morbidity are increased. In American forces in World War I, among 20,662 rifle and pistol wounds involving all regions of the body, the case fatality rate was 4.7 percent, whereas in 52,106 wounds produced by shell, shrapnel, and grenade, the mortality was 7.2 percent. The mortality rate for penetrating wounds of the chest was 31.9 percent for those produced by rifle ball and 46.6 percent for those caused by shell and shrapnel. Among 453 cases from the Boulogne base in 1918 studied by Elliot, sepsis developed in 7.9 percent of the chest wounds produced by bullets and 15.6 percent of those produced by shell. In the American Civil War, of every 10 wounds, about 9 were due to bullets and 1 to high explosive fragments; in World War I, this ratio was about 3 bullet wounds to 7 high explosive; and in this war, it is about 2 bullet wounds to 8 high explosive wounds. This gives some idea of the more severe nature of the wounds occurring in this war. Retained foreign bodies are common and only a little over a tenth of these are bullets, the remainder being fragments of high explosives. A

high proportion of the penetrating wounds are associated with hemothorax. Pulmonary contusions without hemothorax are not infrequent. Combined thoracoabdominal wounds occur in about a tenth of the cases.

NONPENETRATING WOUNDS

While nonpenetrating chest wounds involving only soft parts of the chest wall are of little consequence, those associated with rib fracture can be serious. Complications such as tension pneumothorax, hemothorax, or emphysema resulting from penetration of broken rib fragments are usually of much greater significance than the lesion in the chest wall. Immobilization of the chest wall on the affected side has been the time-honored method in simple rib fracture. This may be done by adhesive strapping well beyond the midline anteriorly and posteriorly or by placing the strapping completely around the lower chest wall. Reports indicate that infiltration of the intercostal nerves with procaine hydrochloride solution is especially effective in the treatment of simple as well as compound rib fractures. The simple procedure quickly relieves pain and respiratory distress. It has also been useful in "stove-in-chest" and other injuries in which pain of the chest wall is important. In "stove-in-chest" immediate immobilization of the chest wall, however, is essential, in order to stop paradoxical movement of the affected part during respiration.

Damage to intrathoracic structures may occur in the absence of demonstrable evidence of chest-wall lesions. While such chest wounds may become serious, most of these patients progress satisfactorily under conservative treatment. Simple contusions of the pleura and lung rarely require more than rest and symptomatic relief. Severe forms of contusions involving the lung with the production of so-called "contusion pneumonia" are not uncommon both in penetrating and nonpenetrating chest wounds. The pathologic lesion which varies with the degree of trauma consists of pulmonary hemorrhage. The severer forms may also show rupture of the lung and in others massive collapse may occur. Late complications depend on the development of infection. Consideration must be given first to combatting shock, second, to the correction of disturbances in cardiorespiratory physiology resulting from hemothorax, pneumothorax, and emphysema, and third, to the prevention and treatment of infection.

Blast injury to the lungs is a form of nonpenetrating chest injury occurring in persons exposed to the detonation of high explosive and observed in 2 to 3 percent of hospital admissions for chest wounds. The mechanism of injury it is believed consists in the impact of the pressure wave on the chest wall. The essential pathologic lesion is intrapulmonary capillary hemorrhage which varies from small ecchymotic areas on the lung surface to such extensive involvement that the lung may appear "hepatized." Clinical manifestations consist of cough,

hemoptysis, fullness of the chest, impaired resonance, and, in some, signs indicating consolidation. The early clinical picture is dominated by anoxia. Few cases show injury due to the direct effects of blast alone, as burns, wounds, and fractures produced by missiles, flying debris, and violent falls are not uncommon. Treatment in uncomplicated blast injuries of the lungs consists essentially of rest, supportive measures, administration of oxygen, and chemotherapy. Because of intrapulmonary hemorrhages and the possibility of furthering this bleeding, great care must be exercised in applying the usual procedures of resuscitation. For this reason, the Schaefer method of artificial respiration for asphyxia is probably undesirable. Transfusion of whole blood plasma or other fluids may be better withheld in the early stages because of the risk of inducing pulmonary edema. Treatment should be directed much along the lines of pneumonia. Associated injuries—fractures, burns, and soft-part wounds—require appropriate therapy but the pulmonary lesions must be kept in mind and methods employed which will not aggravate this condition.

PENETRATING WOUNDS

Hemothorax occurs in a high proportion of battle casualties with penetrating wounds of the thorax. The extreme conservatism engendered in civilian life with this condition has proved to have little or no place in military surgery and in the management of battle casualties the conservative attitude has been abandoned. While civilian experience indicates that only about 30 percent of penetrating wounds give evidence of hemothorax and that from 1 to 2 percent of the cases with hemothorax become infected, in battle casualties hemothorax occurs in about 75 percent and from 25 to 30 percent of such cases are complicated by infection. Danger of recurrence of bleeding has been given as the principal reason for delay in the aspiration of blood from the pleural cavity. Surgeons in this war, however, have found it is the exception for bleeding to recur following aspiration. In this war, early aspiration has become the procedure of choice.

A definite trend has developed toward the abandonment of total air replacement following aspiration for hemothorax, and its use is strongly condemned by many thoracic surgeons who have treated battle casualties. Two objections have been raised: (1) it is not necessary, since bleeding has been found to recur rarely from lung tissue, and it does not prevent bleeding that is coming from the chest wall; (2) if infection occurs, the resulting empyema becomes complete in contrast to a partial one where some portion of the lung, usually the upper lobes, has expanded and adhered to the chest wall.

In this war, it is estimated that massive clotting of blood in the pleural cavity has occurred in 4 to 6 percent of cases with hemothorax. This should be suspected when clinical findings persist after only small amounts of blood can be with-

drawn and serial roentgenograms show no improvement during the fourth to sixth week after injury. These clots, as well as the dense layer of fibrin over the lung, should be removed by operation, followed by complete closure of the wound and waterseal drainage. As fibrin commonly settles out into the lowermost portions of the chest, attempts at aspiration of hemothorax should not be done too low in the thorax. Aspirations are repeated daily or every other day until the pleura is dry.

OPEN PNEUMOTHORAX

Open pneumothorax and sucking wounds have been relatively common. Many attempts were made early in the war to close these wounds hastily by suture, but it was quickly learned that such wounds should not be closed tightly unless facilities were at hand to permit accurate débridement and careful closure. When closed without proper débridement, one or all of several complications occurred frequently—tension pneumothorax, subcutaneous emphysema, or infection of the wound with disruption resulting in a sucking wound surrounded by tissues which could no longer be approximated. It is now the practice in emergency military surgery to trim these wounds of devitalized and soiled soft-tissue and bone fragments, to look for and control bleeding from the intercostal artery, and to make them airtight by molded pads of gauze or petrolatum gauze strapped securely in place by overlapping layers of adhesive plaster. This provides adequate emergency closure and permits air to escape if tension develops. In case of large wounds, the petrolatum gauze packs are held in place by coarse sutures passed through the skin edges and tied over the pads. Patients treated in this way rarely develop tension pneumothorax; they reach a hospital in such condition that they can be carefully débrided and closed completely or be left open with a loose pack in the superficial portions after the muscular layers have been closed in airtight fashion. Where muscle closure is not possible, the lung should be brought into the wound and sutured to the edges. It has been considered advisable to drain all such cases with a catheter and waterseal or flutter valve.

TENSION PNEUMOTHORAX

Tension pneumothorax has occurred more frequently as a postoperative complication, especially following emergency suture closure of a sucking wound in the more forward areas, than it has as a complication of penetrating wounds alone. It has been a constant threat in wounds of the lung where a missile may easily open a bronchus or produce a valve-like laceration in the lung tissue. Its treatment is simple and its recognition easy. To combat its dangers and to maintain a pleural cavity empty of blood, serum, or products of infection, catheter with flutter valve or waterseal drainage has been freely used.

FOREIGN BODIES

The lung and pleura tolerate metallic foreign bodies well. Many of them are sterile, but such material as clothing, rib fragments, and rubble frequently are responsible for infection. The latter must always be removed; the former, if small (1 by 2 cm.) can be left alone unless near a large vessel, the heart, or the esophagus. If foreign bodies near these structures are left until complications occur, their removal becomes much more hazardous. The majority of foreign bodies are in the periphery of the lung where they are readily accessible for a one- or two-stage removal depending on the chances of infection following operation.

The proper timing of operations for removal of foreign bodies has been strongly emphasized. From one to three days following injury, initial surgery should be limited to débridement of the wound in the chest wall, removal of readily accessible foreign bodies in the pleura or on the surface of the lung and closure of the chest wall either complete or leaving the subcutaneous tissue and skin open. Thoracotomy for the removal of foreign bodies in lung tissue is not indicated at this stage. It has been considered far safer to remove a foreign body in the lung after equilibrium has been established, and this usually occurs in from three to ten days. At this time, with the patient in a hospital toward the rear, decision concerning removal of the foreign body can be made. The chances of success are far greater under these conditions than had a hasty operation been performed before equilibrium was established and detailed pre- and postoperative care afforded. The decision concerning removal should be based on size and location of the foreign body, on the likelihood of infection, and on the patient's ability to tolerate the operation.

EMPYEMA

The incidence of infection in penetrating wounds of the thorax in war is in marked contrast to that in civilian life. The difference rests largely on the agent causing the injury. In battle many wounds result from shell fragments which cause more extensive damage, and they are especially liable to carry in with them fragments of ribs and pieces of clothing. When infection has occurred, a wide variation has prevailed in the time at which suppuration appeared. The majority of infections in battle casualties have become manifest in from four days to two weeks, and a small proportion have occurred several weeks after injury. In a rather small group of cases, fulminating infection has appeared within the first two days and, in these, the pus is said to have been dark brown and extremely foul. Early recognition and prompt drainage are most important. In suspected cases, frequent aspirations with cultures and smears are imperative. Empyema resulting from infected hemothorax is notoriously difficult to cure. The mortality ranged between 30 and 50 percent in the last war and

it is relatively high in this war. Prompt early closed drainage, followed by rib resection and adequate exposure of the infected areas, has been considered the most efficacious method of management. Penicillin, used vigorously and early, both prophylactically and therapeutically, it is hoped, may aid in management. To evaluate the use of sulfonamides in this connection has been difficult. Thus far, fewer cases of chronic empyema have been received in hospitals in this country from overseas than were expected.

ABDOMINOTHORACIC WOUNDS

Combined abdominothoracic wounds constitute, according to preliminary reports, about 10 percent of chest wounds, an incidence not greatly different from the last war, in which they were accompanied by about 60 percent mortality. A sufficient number of cases with this type of injury has not been received to determine accurately the mortality rate in the present war. Fragmentary reports indicate it is between 25 and 40 percent. The most pertinent observations made concerning this type of injury are:

1. X-ray and fluoroscopic examinations of the abdomen must be done in all cases of chest wounds since, in a surprising number, the missile has been found to have entered the abdomen.
2. Complete exploration of the abdomen through the diaphragm cannot be performed thoroughly and should not be attempted, except where the path of the missile indicates that all the damage is within reach by this approach.
3. In right-sided injuries, the abdominal damage is usually confined to the liver and in these cases transdiaphragmatic approach alone is more frequently justified.
4. If the chest wound is sucking, it must be closed after débridement with as little intrapleural manipulation as possible before laparotomy is performed.
5. Shock is profound in these cases and adequate transfusions of whole blood, often as much as 1,500 cc., are imperative.
6. The chest should be drained by an intercostal catheter with a waterseal or flutter valve.

MORTALITY

Among 20,607 cases of chest wounds in the American Civil War, the mortality was 27.8 percent, whereas for actual penetrating wounds it was 62.5 percent. In the American forces, during World War I, the total mortality in 4,595 chest wounds was 24.05 percent, whereas in 1,726 penetrating wounds it was 47.68 percent. In the present conflict, in American forces, available statistics on over 20,000 cases show that the total mortality for chest wounds is 8.1 percent and, in penetrating wounds, it is less than 15 percent. This is the lowest mortality rate for chest wounds ever recorded in the history of warfare. Several factors have contributed to this

increased survival rate. Among the most important are (1) advanced facilities and personnel for rendering early and adequate resuscitative measures and for doing good thoracic surgery, (2) chemotherapy, and (3) an efficient system for speedy evacuation of the wounded. Never before have battle casualties received such prompt surgical care by such highly skilled specialists. This has been made possible by (1) the plan in the combat zone which decreases the period between the time of the injury and adequate surgical care, and (2) young medical officers qualified to perform good thoracic surgery and well-grounded in the fundamental principles on which good surgical practice depends. The availability of these highly trained surgeons is a reflection of our carefully nurtured system of postgraduate medical education and their superior performance is a measure of progress made in this field. The principle that the sooner a wounded man receives adequate first aid and subsequent surgical care the more successful are the results is well established. These young thoracic surgeons are grouped in teams with an anesthetist and are attached to and work in field hospital units far forward so that wounded men can within a few hours after injury receive specialized surgical care.

The mortality in cases of chest wounds has been favorably influenced also by the emphasis placed on resuscitation, pre-operative management, and judicious timing and selection of surgical intervention. The control of shock, with adequate amounts of plasma and especially whole blood transfusion and by the use of oxygen and morphine, and the immediate relief of respiratory embarrassment are extremely important. Early bronchoscopic or catheter tracheobronchial aspiration is important in removing blood and secretions from respiratory passages. The early recognition of abnormal cardiorespiratory physiology and the restoration and stabilization of these mechanisms before operative intervention have been found essential. This practice has not only permitted safer surgery but has also diminished postoperative morbidity.

Chemotherapy has probably played a role in the decreased mortality and morbidity among chest wounds. Infection and certainly the more serious forms of empyema and sepsis have been reduced, but the extent to which this can be attributed to sulfonamides has been difficult to determine. This difficulty arises from the presence of other factors such as prompt and good surgical practice. The general impression is that the sulfonamides have decreased the incidence of serious infections. Penicillin, however, has much greater promise, and an effort is being made to determine its field of usefulness in these types of cases.

Dental Prosthetic Needs in the U. S. Army

The reduction in dental requirements in MR 1-9, Standards of Physical Examination During Mobilization, in March 1942 and again in October 1942, placed the responsibility of rehabilitation primarily on the Army Dental Corps. During the first phase of the Selective Service program, records show that 8.8 percent of selectees were rejected for one or more dental conditions.¹ Since October 1942 about one selectee per 1,000 has been rejected for dental deficiencies.

Selective Service System findings. A 10 percent sample of the examinations completed at local boards prior to 30 September 1941 was made available to The Surgeon General's Office through the facilities of the Selective Service System. These data representing twenty-one different states were made on Form 200, Reports of Physical Examination. This report (table No. 52) shows the number of general and limited service registrants who wore dentures. In a total of 121,919 men (whites and Negroes) examined, 3,741, or 3.0 percent, had one or more dentures. Of 107,827 whites represented in this study, 3,660, or 3.4 percent, had one or more dentures, while of 14,092 Negroes examined, only 81, or 0.5 percent, had one or more such prosthetic appliances. There were 0.5 percent of the whites and 0.03 percent of the Negroes with full upper and lower dentures in this particular sample.²

Another study was submitted by the Selective Service System on the incidence of dentures in 87,108 selective service registrants (white and Negro), representing the period between April and June 1942.³ These data include 44,216 registrants who were rejected. There was a total of 8,534 registrants, or 9.7 percent, who had one or more dentures. Of interest is the fact that only 218 of the 8,534, or 2.4 percent, stated that their dentures were unsatisfactory. The following number of registrants and types of dentures were listed: 1,287, or 1.4 percent, had full upper and lower dentures; 1,745, or 2.0 percent, had one full denture; 267 or 0.3 percent had a full denture and an opposing partial denture; and 5,235, or 6.0 percent, had one or more partial dentures.

From the Dental Division of The Surgeon General's Office.

1. Causes of Rejection and Incidence of Defects, Local Board Examinations of Selective Service Registrants in Peacetime, an Analysis of Reports of Physical Examination from 21 Selected Cities, Medical Statistics Bulletin No.2. Washington, D. C.: National Headquarters, Selective Service System, 1 August 1943.

2. Tabulations Dealing with Dental Defects, letter to Office of The Surgeon General, 1 May 1943, 7-4, 30-84E, National Headquarters, Selective Service System.

3. Tabulations Dealing with Dental Defects (Table No. 52A Attached), letter to Office of The Surgeon General, 17-5.22-84-E, 25 May 1943, National Headquarters, Selective Service System.

The study also indicates that of 76,219 white registrants, 8,234, or 10.8 percent, wore one or more dentures, while of the 10,888 Negroes, 300, or 2.7 percent, had one or more dentures. Only 8 Negroes, or 0.7 percent, had full upper and lower dentures, while 1,279 whites, or 1.6 percent, wore the full complement of artificial teeth.

Findings of Medical Statistics Division. A report was submitted by the Medical Statistics Division of The Surgeon General's Office, September 1943, which represented a 5 percent sample of the March 1943 Reports of Physical Examination and Induction (SS Form D.S.S. 221), or 16,192 inductees, of whom 14,752 were whites and 1,440 were Negroes.⁴ This study showed that 3.7 percent of the white and only 0.6 percent of the colored inductees had dentures.

This interesting report showed also that 11.7 percent of the 16,192 inductees were recorded with all teeth present, the white population having 10.0 percent in this category and the Negroes 28.4 percent.

Surveys and examinations in Army dental clinics. A dental examination was made of 84,150 inductees during 1942 at Camp Joseph T. Robinson, Arkansas.⁵ These data in the main represent the period prior to the reduction in dental requirements, 15 October 1942, and show the need of the inducted men before the requirements were reduced to the minimum. Of these men, 4.1 percent had to have one or more dentures and 22.5 percent of the total were in need of emergency dental treatment.

Another study was made on several groups by the Chief of the Dental Service, Ft. Belvoir, Virginia.⁶ The data were secured by reviewing the M.D. Forms 79 of certain units as well as by spot checking the M.D. Forms 79 in the files at random to determine the denture needs. The data show:

1. Of 1,000 selectees whose average age was 25 years, from the northeastern section of the United States, 14.4 percent required one or more dentures.

2. Of 926 selectees from the First, Second, Third, and Fifth Service Commands, 25 percent required one or more dentures.

3. Of 1,000 selectees (spot check from general files), 6.3 percent required one or more dentures.

4. Of 1,335 men from all sections of the country, 10 percent required one or more dentures.

From the information herewith presented and from other miscellaneous data, the Dental Division has concluded that about 15 percent of all inductees require one or more dentures.

4. Dental Defects Among Army Inductees, March 1943, Report No. 10, W.D., S.G.O., Medical Statistics Division, Statistical Analysis Branch, 28 September 1943.

5. Data from Annual History, 1942.

6. Personal communication with Dental Division, 1943.

TABLE I
Prosthetic needs of 107,542 denture patients

Age	Full upper and lower	Full upper and partial lower	Full lower and partial upper	Full upper	Full lower	Partial upper and lower	Partial upper	Partial lower	Total number of patients with dentures	Total full upper	Total full lower	Total partial upper	Total partial lower	Grand total	Percentage of dentures at various age levels
18-20	395	787	29	1,011	126	2,908	5,800	3,492	14,548 13.5%	2,173	550	8,737	7,187	18,647	12.7%
21-24	885	1,365	50	1,366	203	4,821	8,273	5,718	22,681 21.1%	3,616	1,136	13,142	11,904	29,798	20.3%
25-29	1,450	2,106	80	1,830	360	5,862	8,344	6,770	26,802 24.9%	5,386	2,426	14,286	14,738	36,836	25.1%
30-34	2,405	2,338	80	1,980	517	5,249	6,294	5,698	24,561 22.9%	6,723	3,002	11,623	13,285	34,633	23.6%
35 and over	3,781	1,936	86	1,871	600	3,252	3,816	3,608	18,950 17.6%	7,018	3,796	7,154	8,796	26,764	18.3%
Total	8,916	8,532	325	8,058	1,806	22,092	32,527	25,286	107,542	24,916	10,910	54,942	55,910	146,678	100%
Percent- age of patients	8.3%	7.9%	.3%	7.5%	1.7%	20.6%	30.2%	23.5%	100%	17.0%	7.4%	37.5%	38.1%	100%	

Dentures were constructed only for individuals who required them to masticate the Army ration. This does not necessarily mean that the complete prosthetic needs for any individual have been fulfilled.

No definite policy regarding the minimum number of teeth necessary to masticate the Army ration has been developed for the reason that many variables must be considered in each patient. Some individuals stated they could masticate the available food without difficulty with three pairs of opposing posterior teeth and a like number of anterior teeth; others found this number ineffective. A denture, therefore, was constructed for the borderline cases, as well as for many others who considered such an appliance essential.

Prosthetic needs of 107,542 denture patients. Data from M.D. Forms 124 (McBee Keysort Card) during the period 1 June 1943 to 1 September 1943 show that 146,678 dentures were constructed for 107,542 denture patients, or 1.36 dentures per individual. The denture patient in civil life would in all probability have had more than 1.36 dentures, since the Army Dental Corps did not attempt to present dentures to those soldiers who had a sufficient number of teeth to masticate the average food. It is important to note that 13.5 percent of the denture patients were between 18 and 20 years of age inclusive, and that 12.7 percent of all dentures were made for this age group (see table I).

The percentage of denture patients with full uppers and lowers was 8.3, while the combination of full lowers and upper partial was only 0.3. There were 7.5 percent of the patients wearing a single full upper and only 1.7 percent wearing a single full lower; 20.6 percent of the denture patients had a combination of a partial upper and a partial lower.

Analyzing the 146,678 dentures as to type, one finds that 17.0 percent of all dentures made were full uppers, 7.4 percent full lowers, 37.5 percent partial uppers, and 38.1 percent partial lowers.



Native huts and tents used as wards for a hospital in New Guinea. Signal Corps photograph.

Original Articles

March Fracture

Report of 313 Cases

LIEUT. COLONEL CLARENCE W. HULLINGER

Medical Corps, Army of the United States

and

MAJOR WILLIAM L. TYLER

Medical Corps, Army of the United States

Although a common affection of the foot of the soldier, march fracture is frequently overlooked by medical officers because it is seldom seen in civilian life. The subject should be of interest to both the civilian doctor and the medical officer, since it should be considered in the differential diagnosis of all painful feet.

Breithaupt, who first described this syndrome in 1885, reported several cases in soldiers in the German Army following forced marches. A few articles on march fracture appeared in the American literature at the close of World War I, since when there has been little writing on the subject in this country except since the present war began. One is amazed in reviewing the literature at the number of contributory factors mentioned as etiological possibilities; indeed, some twenty-eight such possibilities were found to have been mentioned.

We have sufficient data to satisfy ourselves that march fracture occurs, not because of mechanical weakness or anatomic variation of the foot or extremity, but as a result of a physiological weakness secondary to fatigue that is brought on by increasing the load the soldier must carry and keeping him going after he tires. As the fatigue increases, the soldier marches not with his muscles "in tone" but relaxed and tired. Mechanically, his weight is borne by the bones and ligaments.

Read, in abstract form, at the meeting of the Chiefs of the Surgical Services of the Army Hospitals of the Fourth Service Command, Atlanta, Georgia, 6 August 1943.

The following medical officers assisted in the care and treatment of these patients: Major W. B. Timmerman, Major W. I. Carney, Captain Gerald Shortz, Captain A. C. Davis, and the officers of the Orthopedic Service of the 111th Station Hospital.

Since this paper was written there have been 76 additional cases of march fracture admitted to the Orthopedic Service of this hospital. There was one fracture of the fifth metatarsal bone and two additional cases of fracture of the calcaneus.

This allows repeated micromotion of the bone itself which eventually breaks much the same as a wire will break from repeated bending. Micromotion is more apt to occur when walking on hard surfaces.

We believe that trauma is the exciting cause in all cases and that the only difference between these and any other fractures due to trauma is that they occur from repeated trauma rather than one single violent trauma. We feel that certain factors render a soldier less able to withstand the trauma whether it be a single violent trauma or repeated sub-threshold injuries: (1) certain psychiatric types who tire early; (2) insufficient rest; (3) overwork; (4) poor musculature and weak individuals; (5) disgruntled individuals. In our series, anatomic variations were of no consequence. Measurements were taken from roentgenograms of metatarsal length, width, and spacing; position and conformity of sesamoid bones; length and width of feet; and general conformation of feet. These were compared with an equal number of x-rays (300) which were considered as taken at random and were an average run of feet in soldiers. There was no essential difference in the average of measurements in these two groups.

We agree with Bush¹ in that none of our cases of march fracture had a large central callosity or plantar wart underlying the heads of the metatarsals. This is because soldiers with large plantar callosities will develop so much pain on extended use that they are forced to quit before the trauma becomes sufficient to cause fracture. However, we have seen five cases in active athletes, one in a professional football player, eight cases in Negroes and many in white soldiers with third-degree pes planus, and two fractures in patients with definite pes cavus and claw toes. Two nurses were in the group. The majority of patients had normal feet. While the proper fit of the shoe was not considered significant, six patients were seen whose shoes were improperly fitted.

At Camp Wheeler, we had, up to 1 August 1943, 300 patients with 313 march fractures. We believe there have been 100 additional cases with early march fractures in soldiers who in going over the obstacle course completed their

1. Bush, L. F.: March Foot, Army M. Bull., 68:126-134, July 1943.

fracture by jumping and thus gave a definite history of injury. The latter group has been eliminated from consideration in this paper.

Each patient in the march fracture group had a positive x-ray, either a fracture line or definite callus formation. An additional large number of patients were seen who had many of the earlier signs of march fracture but who never had a positive x-ray. There were about 450 patients in this group. The exact number cannot be determined as many were not admitted to the hospital and they

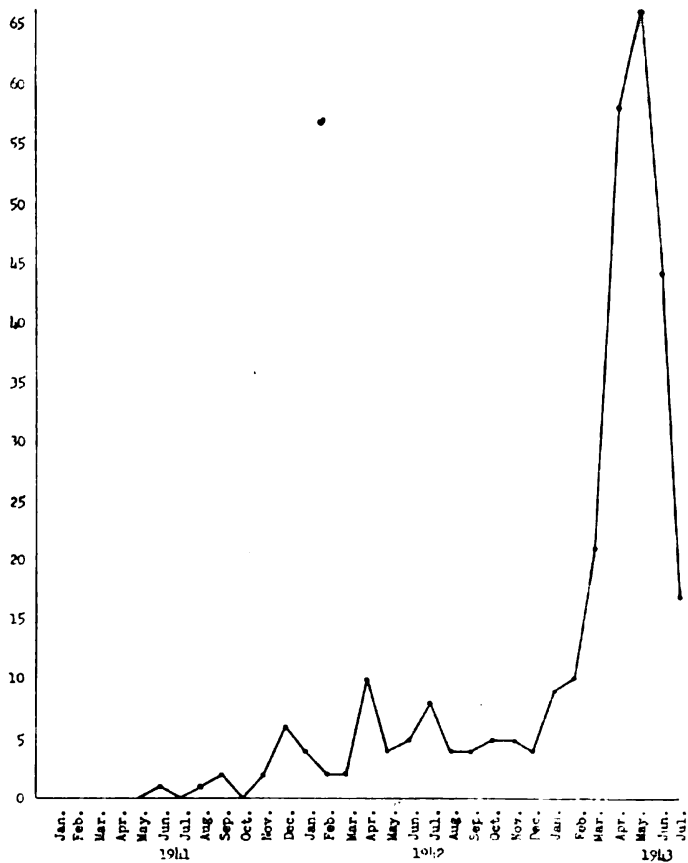


CHART 1. The incidence of admissions to the hospital.

are excluded from this paper. These cases were diagnosed as foot strains or tenosynovitis, according to the pathology found. Many of them might have developed march fracture had the trauma continued.

The incidence of march fractures at this camp markedly increased (chart 1) beginning in March 1942, as a result of a training order issued in February, which stated that all trainees would carry rifles and full packs at all times during the training program, that the men would march by foot from one area to another instead of riding, and that they would move to adjacent areas frequently on the double time. This increased the admission to the hospital for march fractures to a peak of 66 for the month of May. On 24 May a memorandum was issued, lessening the strenuousness of the training program with the result that the number of cases fell off in June to 44 and in July to 17. There are three periods in the training pro-

gram during which the trainees do a large amount of walking and marching, and these are followed in each instance by an influx of patients with march fractures.

Previously it was thought that sedentary occupations were responsible. While this may be a factor, particularly with regard to early fatigue, it is only a mild contributory factor (chart 2). Weight was thought to be a factor, but all weights

CHART 2

Civilian occupations prior to induction in Army

Farmer	26	Butcher	3
Student	26	Salesman	3
Laborer	25	Blacksmith	3
Clerk	23	Steel foreman	3
Machinist	17	Spot welder	3
Truck driver	10	Shipyard worker	2
Textile worker	7	Teacher	2
Mechanic	6	Baker	2
Inspector	6	Nurse	2
Storekeeper	6	Molder	2
Cook	5	Purchasing agent	2
Mill worker	4	Ore miner	2
Waiter	4	Bookkeeper	2
Cabinet maker	4	Elevator operator	2
Office boy	4	Police	2
Tire repairer	3	Janitor	2
Carpenter	3	Cloth cutter	2
Fireman	3	Construction gang	2

Many other occupations 1 each.

are represented in our group with the largest single number being in the weight-group of 140 pounds. The average weight was 158.16 pounds (chart 3).

Youth has been reported to be a predisposing factor. While during our large influx of patients a great percentage of them were from 18 to 21 years of age, on comparing the average age of all the trainees in the camp at that time, the percentage lines roughly parallel (chart 4).

PATHOLOGY

While this type of fracture has been reported as occurring in the tibia, fibula, femur, calcaneus, pelvis, and cuneiform, it is most frequently found in the second and third metatarsal bones. In our series of 313 fractures, we have had one fracture of the first metatarsal, one of the fifth, three of the calcaneus,

one of the fibula, and two of the tibia. Six of our cases showed bilateral fractures. The remainder of the cases were march fractures of the second, third, and fourth metatarsal bones. The right extremity was involved in 173 cases, the left in 140 cases, making



CHART 3. Weight in pounds of patients. Average weight 158.16 pounds.

the incidence of the right 11 percent greater than the left. This could not be accounted for, except that several officers stated that the soldier is loaded heavier on the right than the left. The greatest difference is seen in the third metatarsal, which was fractured on the

right in 107 cases and on the left in 79 cases, (chart 5). The third metatarsal bone was involved in 59.4 percent and the second in 34.2 percent and the fourth in 3.8 percent. This is at variance

with most published reports which give a greater percentage of involvement of the second metatarsal. The proximal third of the metatarsal was fractured in 17 cases (5.4 percent), the middle third in 131 cases (42 percent), and the distal third of the bone in 158 cases (50.5 percent).

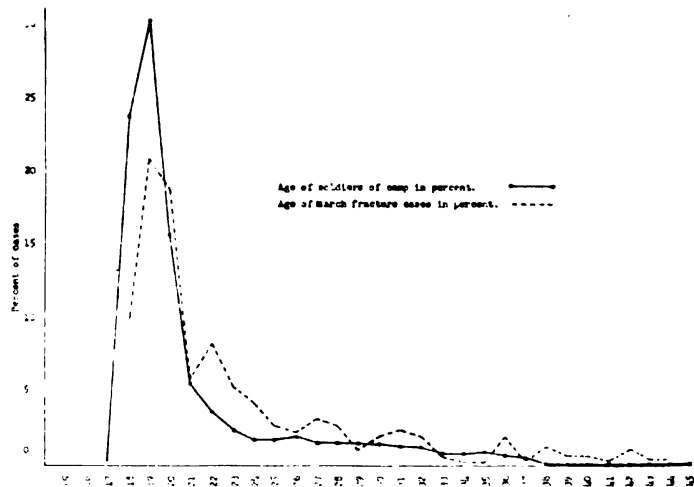


CHART 4. Comparison of age of patients with ages of all soldiers in camp.

All degrees of fracture of the metatarsal bones are seen, depending on the continuance of trauma on the bone and the

time of instituting treatment. In 18 percent of the cases, the first roentgenogram was negative but all of them later showed positive roentgen evidence. In 40 percent of the cases the first roentgenogram showed slight subperiosteal calcification on the anteromedial aspect, in 19 percent an incomplete fracture line was seen on the anteromedial aspect of the bone, and

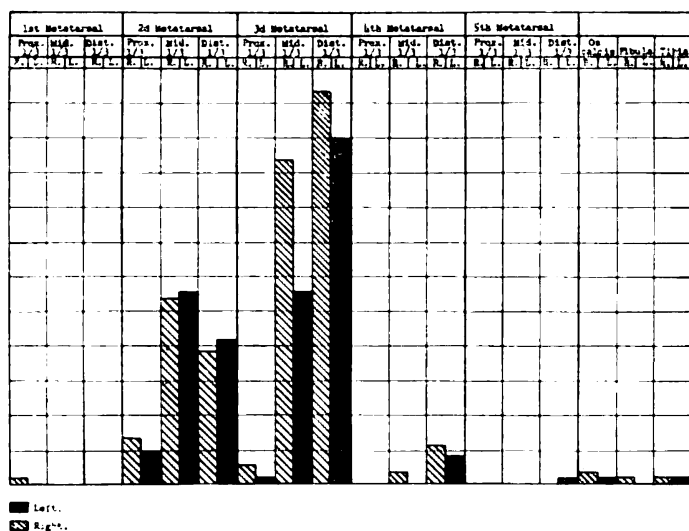


CHART 5. Location of fractures. 313 fractures in 300 patients. 6 cases bilateral. 5 patients with 2 or more bones fractured.

complete fracture line was seen in 16 percent without any evidence of callus formation. In 7 percent a complete fracture line was revealed with varying degrees of callus tissue formation. The appearance of callus tissue or the incomplete fracture line on the antero-medial aspect of the fractured

bone is a constant finding in the cases that are seen at that stage. In only two cases did the fracture line or callus first appear on the lateral side of the bone. Of course, as the fracture becomes complete the callus becomes fusiform.

MECHANISM

On viewing this large series of x-rays, the mechanism of fracture and healing would seem to be as follows: Because of the repeated minimal trauma, there is an incomplete fracture of a few of the bony trabeculations of the shaft, which is most often not visible by roentgenogram. This is followed by hemorrhage which being on the surface produces an elevation of the periosteum. New bone is then formed in the hematoma. Calcium deposits are seen in this area at an early date. If the trauma continues, there is fracture of additional bone trabeculations and additional hemorrhage, further elevating the periosteum and giving rise to additional osteogenesis. There is then slight absorption of calcium at the fracture ends with the dehiscence becoming visible by x-ray. If the trauma ceases,

the fracture then proceeds to orderly healing with complete repair. The periosteal callus becomes dense and spindle-shaped and new trabeculations are seen traversing the fracture site. Variations in this picture depend on the application of the trauma. Severe initial repeated traumata may produce a complete fracture even with slight displacement of the fragments. Less severe repeated traumata acting over several days produce small incomplete disruptions of bony trabeculations and hemorrhage on each occasion with subsequent profuse periosteal callus formation. To prevent the continuance of this trauma, treatment by complete immobilization becomes imperative. Excessive amounts of callus formation were nearly always followed by disability for varying periods of time due to pain. When the callus is excessive, it remains present a considerable time; even after two years there is marked spindle-shaped elevation, and thickening of cortex seen on the radiogram. In properly treated cases this thickening is scarcely evident after a year.

SYMPTOMS

The length of time between the onset of symptoms and admission to the hospital varied. Many patients could not remember exactly when their feet began to hurt and would frequently say for about a week. Six cases were seen in which the fracture was considered entirely healed when first seen. The history in these cases (metatarsal fractures) frequently reveals that the pain in the foot dated from the day following a long march with full pack.

EXAMINATION

1. Limp on walking (may be absent). 2. Swelling and redness of the dorsum of the foot, usually over the bone involved, but may involve the entire midportion of the fore part of the foot. 3. Constant point tenderness over the fracture site. 4. Marked pain when examiner attempts to bend the metatarsal area with his hands. 5. If the fracture is complete, percussion on the tip of the extended toe of the affected metatarsal will elicit marked pain. 6. Tenderness on pressure of the head of the affected metatarsal with toe dorsiflexed.

DIAGNOSIS

The history of pain in the foot, usually following a long march, accompanied by swelling of the dorsum of the foot, should suggest march fracture. Even though the roentgen-

ogram is negative, if pain persists the patient should be rechecked a few days later and if a march fracture is present there will be roentgenographic evidence.

The technical qualities of the roentgenogram must be perfect. There should be both dorsal-plantar and lateral oblique exposures. The oblique view is of the greatest importance, as it frequently reveals the minute fracture line or the slight strand of subperiosteal calcification when the other view is apparently negative.

March fractures must be differentiated from: tenosynovitis, sprains and strains, fractures from other causes, cellulitis, Freiberg's infraction, bursitis, sesamoiditis, luetic periostitis, sarcoma, and foot pain from other causes.

TREATMENT

All cases recover regardless of the type of treatment. It is a well-established principle in fracture treatment that motion at the fracture site produces excessive callus formation. Early in our series of cases it was found that treatment by plaster cast produced early healing without excessive callus formation. After removal of the cast, patients had less pain and returned to duty at an earlier date. The six cases that were seen first when their fracture was healed all had an excessive amount of callus formation and complained of pain on walking. In this series 274 patients were treated by the application of a lightly padded plaster of paris cast from the tip of the toes to the middle third of the leg. The cast was well molded over the plantar surface of the foot and around the heel and malleoli. In some cases, walking irons were incorporated; while this seemed to make little difference in the healing, the patients liked them. The other 26 cases were treated in various ways, generally unsatisfactory.

Eliminating the two cases of long hospital stay due to complications the average hospital stay in this series was 32.75 days. On leaving the hospital, each patient returned to duty into a rigorous training program.

COMPLICATIONS

Complications, sufficient to cause readmission to the hospital, were present in sixteen patients, 5.3 percent. Eleven patients were readmitted because of foot pain and swelling with the roentgenogram being negative except for the healed fracture. These patients had excessive callus formation and were either seen later (i. e., were not x-rayed until after the

fracture was present for many days and there was already marked callus formation) or were in the early group that was treated without immobilization in a molded cast. One patient developed posttraumatic osteoporosis of the Sudeck's type and required 163 days' hospitalization. He was then discharged from the Army because he was over forty and permitted to return to an essential civilian occupation. On leaving the hospital there was marked improvement in the radiogram and he walked without limp and had no complaints. One patient developed a moderate swelling of the foot of a lymphedema type. He required 176 days hospitalization and returned to full duty. The latter two patients were treated symptomatically and by lumbar sympathetic novocain injections. One patient with a fracture of the third metatarsal returned to the hospital in 74 days with a new fracture of the second metatarsal in the same foot. Two patients were readmitted with a new march fracture of their other foot. However, all patients completed their training here. Requests were received for records on two of these patients from other hospitals, incident to discharge from the service for psychoneurosis and there was no abnormality present in the feet.

CONCLUSIONS

1. March fractures are produced by trauma in the form of repeated sub-threshold insults to the bone, by walking.

2. It occurs, not as a result of any mechanical weakness or anatomic variation of the foot, or extremity, but as a result of physiological weakness secondary to fatigue.

3. The large number of patients was coincident with more rigid training program.

4. The stages in the training program of most marching produced the most fractures.

5. Prior civilian occupation may be a mild contributory factor in causing early fatigue.

6. The weight of patients and their age do not seem to be contributory.

7. Roentgenograms must be as nearly perfect technically as possible to facilitate an earlier diagnosis.

8. The roentgenogram in characteristic cases appears to be the result of a series of very small incomplete fractures at the same site.

9. Treatment should be complete immobilization to prevent motion at the fracture site.

10. Complications are very few in cases treated by complete immobilization.

Colorado Tick Fever

Report of Thirty-nine Cases

CAPTAIN JOHN D. COLLINS

Medical Corps, Army of the United States

From time to time a benign, intermittent, febrile disease has been reported throughout the Rocky Mountain area. Although not limited to Colorado, this disease has been commonly known as "Colorado tick fever," "mountain fever," or "mountain tick fever." Army medical officers with troops in Colorado and Wyoming were probably the first to report the presence of an intermittent, febrile illness occurring in the late spring and early summer, some of these reports dating back to 1875. Toomey¹ summarized the early history of fevers encountered in these regions. In 1926, in an article on Rocky Mountain spotted fever, Becker described a benign syndrome following tick bite,² and in 1930 he named this syndrome "Colorado tick fever."³

A group of cases was encountered in May and June 1943 at Camp Carson Station Hospital, characterized by sudden onset of aching in the muscles, bitemporal headache, malaise, chills and fever, marked leukopenia, and after the subsidence of the fever, a period of defervescence, followed by a secondary rise in fever and return of the initial symptoms. All cases showed an almost total absence of abnormal physical findings.

Of the 39 cases here reported, all were males between the ages of 20 and 40, in supposedly good health until the present illness. In every instance a history was obtained of having bivouacked for several days in the vicinity of Lake George, near Colorado Springs, a region notorious for the number of ticks found there.⁴ All ticks removed in the hospital from these

1. Toomey, Noxon: Mountain Fever and Spotted Fever of the Rocky Mountains—Clinical Studies, *Ann. Int. M.*, 5:585-600, Nov. 1931.

2. Becker, F. E.: Investigations of Rocky Mountain Spotted Fever in Colorado, *J. Infect. Dis.*, 39:81-88, July 1926.

3. Becker, F. E.: Tick-borne Infections in Colorado. 1. Diagnosis and Management, *Colorado M.*, 27:536-545, Feb. 1930.

4. Bishopp, F. C.: Ticks and the Role They Play in the Transmission of Diseases, pp. 389-406, Annual Report of the Board of Regents of the Smithsonian Institution, 1933.

patients were identified as *Dermacentor andersoni*. Becker⁵ states that "*Dermacentor andersoni* Stiles is the only tick we have seen attached to man in Colorado." It seems probable, therefore, that this was the tick causing the bites encountered in this group of cases. Twenty-seven of the 39 patients gave a definite history of being bitten by ticks. The exact period between the tick bite and the onset of symptoms of the disease was difficult to determine.

The similarity of the symptoms in all of these cases is remarkable and is summarized in tables I and II.

TABLE I

History of tick bite.

Definite bite:	27 cases.
Tick removed from skin:	5 cases.
No known tick bite:	7 cases.

Time between tick bite and onset of disease: 4.7 days, average.

Duration of first febrile period: 1.2 days, average.

Duration of remission in fever and symptoms: 2.0 days, average.

Duration of relapse: 1.7 days, average.

Height of the fever. (First period) Range 99.6 to 105.0 in 36 cases; unknown in three cases; more severe than second period in 16 cases. (Second period) Range 99.0 to 104.0; more severe than first period in 15 cases. Fever curves of first and second periods equal in 5 cases.

TABLE II

Symptoms:

Fever	39 cases
Chills	36 cases
Headache	30 cases
Muscle aches	25 cases
Weakness	20 cases
Cough	14 cases
Pain in eyes	3 cases
Sore throat	3 cases
Stiff neck	1 case
Nausea, vomiting	1 case
Sweating	1 case
Anorexia	1 case
Rash	1 case

White blood count:

1,000 plus	2 cases
2,000 plus	10 cases
3,000 plus	15 cases
4,000 plus	6 cases
5,000 plus	3 cases
6,000 plus	2 cases
7,000 plus	1 case
8,000 plus	1 case

All of the counts over 6,000 white blood count were either late in the second fever curve or in convalescence.

In 38 of the 39 cases two febrile periods were encountered. One case showed all the other findings of the illness but was without secondary fever. Parker⁶ described similar cases and

5. Becker, F. E.: Tick-borne Infections in Colorado. 2. A Survey of the Occurrence of Infections Transmitted by the Wood Tick, Colorado M., 27:87-95, March 1930.

6. Parker, R. R., and Davis, G. E.: Colorado Tick Fever, Sta. Circ., No. 2, First Revision, March 1935, U. S. Public Health Service, Rocky Mountain Laboratory, Hamilton, Montana.

also mentioned an occasional third phase of fever, a condition which was not encountered in our series. Figures 1, 2, and 3 represent typical fever curves which were picked at random from our series.

This disease occurred in previously healthy white males only when they left their usual camp and bivouacked in a new and tick-infested mountainous area.

Although some patients denied having been bitten by ticks, 5 of the 12 who denied this admitted having removed ticks from their skin or clothing; other men were admitted to hospital, denying tick bites and yet on examination live ticks were found attached to their bodies. The bites were not painful and the men had no knowledge, on discovering the ticks, how long they had been embedded

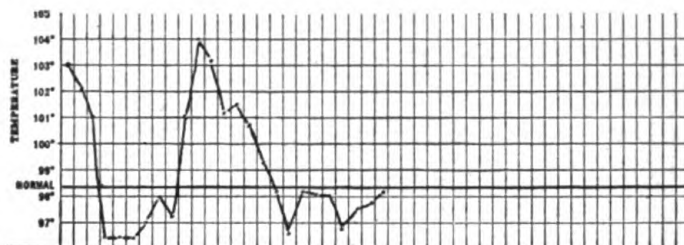


FIGURE 1. Fever curve case No. 3.

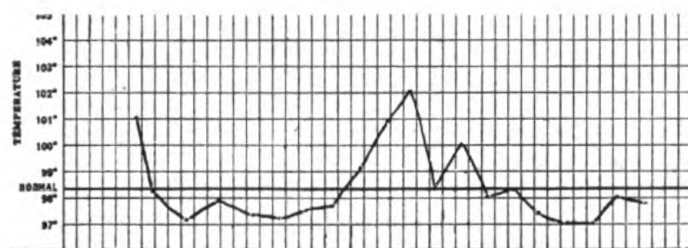


FIGURE 2. Fever curve case No. 7.

in the skin. Not a single case developed in a soldier who had not been on bivouac. Attendants, medical officers, and members of the Army Nurse Corps who were constantly in close contact with these patients showed no signs of contracting this illness, indicating that the disease is not transmitted by human contact.

Because in several instances the medical officers believed the patients to be suffering from uncomplicated grippe or mild influenza, no blood counts were secured until late in the relapse or in convalescence. Even so, only 4 of the 39 cases failed to show counts below 6,000 white blood count. The neutrophils and lymphocytes were depressed

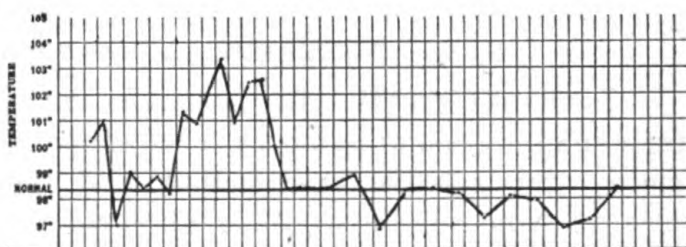


FIGURE 3. Fever curve case No. 13.

about equally ; in other respects the differential counts were normal.

No complications were encountered and, aside from weakness and lethargy for a few days after the second febrile period, no persistent ill effects were observed.

A characteristic feature was the paucity of physical findings. In contrast to other illnesses characterized by similar onset only a slight injection of the oral pharynx was reported, and although nonproductive cough was a frequent complaint, chest examination, including x-ray films in several cases, was negative. One case had a faint macular rash on the evening of admission but it had completely faded by morning.

The duration and severity of the two febrile periods, including the symptoms which accompanied them, were, as shown in the tables, almost equal in intensity.

Sedimentation rates were obtained in a few cases, and these were either normal or slightly elevated. *Proteus* OH 19 and OX 19 agglutination titers were determined in a few cases, but, as observed previously by Topping⁷ and Parker and Davis,⁶ they were not significantly elevated and did not increase as the disease progressed.

Therapy was symptomatic, although sulfa drugs were used in six cases without noticeable benefit. Salicylates and codeine relieved the myalgia and headache to a large extent and dehydration was combatted by copious fluid, given intravenously when necessary. Laboratory facilities to investigate the etiology further were lacking. Attempts to reproduce the disease in laboratory animals by others^{6 7} have been unsuccessful and the etiologic agent is as yet unknown.

DIFFERENTIAL DIAGNOSIS

In the differential diagnosis, one must consider influenza. Influenza is accompanied by a leukopenia, which is, however, more often relative than actual, and the fever usually persists for from one to five days when the temperature generally falls by rapid lysis. In the absence of secondary complications, relapses do not occur. Respiratory symptoms are prominent in the majority of influenzal patients. Characteristic epidemiologic features and the more common occurrence in the

7. Topping, N. H., Cullyford, J. S., and Davis, G. E.: Colorado Tick Fever, Pub. Health Rep., Wash., 55:2224-2237, 29 November 1940.

winter months serve as differential aids. Influenza is limited to no particular parts of the country and, unlike Colorado tick fever, is more common in thickly populated areas.

Rocky Mountain spotted fever, because of its occurrence in similar regions, its probable transmission by the tick family, the headache and severe pains in the bones and muscles, might at first be confused with Colorado tick fever. In Rocky Mountain fever the petechial eruption appearing first on the extremities and then becoming generalized, the longer febrile period, along with leukocytosis and positive Weil-Felix reaction should make differentiation easy in all but atypical cases.

Typhoid fever is also characterized by a leukopenia, but the onset is gradual, frequently accompanied by gastro-intestinal symptoms, and typhoid organisms can be recovered from the blood stream in about 85 percent of the patients during the first week of the disease.⁸

White blood counts of 2,000 to 5,000 are also frequently encountered in malarial fever but here, too, the diagnosis can be made by examination of the blood for malarial parasites.

Tularemia is sometimes transmitted by the bite of the wood tick and during the first week may be hard to differentiate. A rash may occur at any stage of tularemia, but there is frequently glandular involvement and specific agglutinins for *Bacterium tularense* are almost always present during the second week of the illness.

Dengue fever, like Colorado tick fever, is characterized by a leukopenia and secondary rise in fever, but its distribution is limited to the habitat of the *Aedes aegypti* mosquito; there is more severe involvement of the bones and joints, and a rash is present during the secondary febrile period.

SUMMARY

Thirty-nine males became ill with fever, chills, headache, and myalgia lasting from one to two days, followed two days later by a relapse of similar character. A leukopenia was an almost constant finding. All of the men had sojourned in tick country and the majority gave a history of being bitten by ticks. It is believed that these cases represent a definite disease of unknown etiology previously described as Colorado tick fever.

8. Paullin, James E., in "A Textbook of Medicine," Ed. by Cecil, Russell L., 5th edition, p. 246. Philadelphia: W. B. Saunders Co., 1941.

Meningococchemia

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Six cases of chronic meningococchemia without accompanying meningitis were recognized at a station hospital in this country during and following an outbreak of meningococcic meningitis. The clinical features of these cases will be described.

Meningococchemia is characterized by sudden onset, with fever, pain in the joints, chills or chilly sensations, and skin eruptions. The fever has been of three varieties. The intermittent variety, which was most common, ranged from 99° to 103° F. and continued as such until therapy was started. The second variety presented a typical tertian paroxysm, and the third variety a typical quartan paroxysm. Rise in temperature was frequently accompanied by chills and a skin rash.

Migratory arthralgias were common, but no instance of swelling or suppurative arthritis was encountered. The joint symptoms, which were very prominent in most cases, were present early in the disease and persisted as long as three months after clinical and bacteriologic recovery. In 1919 Herrick and Parkhurst¹ formulated a classification of the various joint phenomena associated with meningococcal infections.² They classify meningococcic arthritis into three groups, types A, B, and C. Type A is a transitory arthritis that occurs early in the disease and is associated with a body rash. The joints are painful and tender on motion and there is no effusion into the joints. The pain is said to be due to hemorrhagic lesions of the joints and synovial structures. Type B occurs after the fifth day of the disease, is usually monoarthric, affecting the knee most often, and is associated with signs of purulent effusion. The signs persist for four weeks and complete recovery follows. Type C refers to joint symptoms associated with serum therapy.

The most striking feature of meningococchemia is the skin eruption which appears in the first week. The lesions tend to disappear after several days and then recur. New

1. Herrick, W. W., and Parkhurst, G. M.: Meningococcus Arthritis, *Am. J. M. Sc.*, 158:473-481, 1919.

2. Dimson, S. B.: Chronic Meningococcal Septicaemia Treated with 2-(p-aminobenzenesulphonamido) pyridine, *Lancet*, Lond., 2:424-426, 20 Aug. 1938.

crops come out with each rise in temperature and disappear in twenty-four hours to recur again with another rise in temperature. These lesions vary in type, size, and distribution. In most cases two types of lesions and in a few cases three types were present. There were faint red macules from $\frac{1}{4}$ to 1 cm. in diameter, or faint red papules which were indurated and tender resembling erythema nodosum, or small petechial lesions and large hemorrhagic lesions. The most characteristic lesion was a rose-colored macule with a pinhead-sized vesicular, pustular, or petechial center. Some cases had no eruption. No other physical signs were found except in one patient who had an enlarged spleen. No patient appeared to be in acute distress or very toxic, in spite of the septicemia, in contrast to gonorrheal septicemia and the acute meningococcic septicemias.

Complications were not encountered. In the literature meningitis is mentioned as the most important and frequent complication. Nephritis and epididymitis are said to occur in some cases. We studied several cases of epididymitis on the genito-urinary service with the view that they might be due to the meningococcus but were unable to confirm this possibility.

CASE REPORTS

CASE 1. A soldier, 21 years of age, admitted to the station hospital on 13 May 1943, complained of fever, chilliness, and red spots on the chest of four days' duration. The patient stated that each day he had recurring fever, chilliness, and new crops of spots on different parts of his body.

He was well nourished, alert, and not acutely ill. A maculopapular eruption was present over the chest, abdomen, arms, and legs, and a few erythematous blotches about 1 cm. in diameter were on the arms and abdomen. The pharynx was congested. The temperature was 100° F., the pulse 70, and the respiration, 20. The leukocyte count was 8,700 with 65 percent polymorphonuclears. Blood cultures taken on 14, 15, and 16 May were positive for meningococcus type I; nasopharyngeal culture was negative.

The patient felt comfortable during the day but each evening felt chilly and his temperature rose to 102° F. With each rise of temperature, a new crop of macules and maculopapules appeared.

On 16 May sulfadiazine treatment was begun.²³ The first dose was 2 gm. repeated in two hours, then 1 gm. every four hours for five days. The temperature dropped to normal on 17 May and remained normal and subsequent blood cultures on 18 and 20 May became sterile. The patient made an uneventful recovery and was discharged on 4 June 1943.

CASE 2. A soldier, 19 years of age, admitted to the station hospital on 5 April 1943, complained of joint pains, chills, fever, sweating, and transient upper abdominal pain. The onset was rather sudden, eleven days prior to admission. Shortly after the onset of symptoms he developed pain in the shoulders, elbows, hips, knees, and ankles. The symptoms had subsided and recurred at frequent intervals.

The patient was well developed, well nourished, flushed, and toxic. A discrete, flat erythematous eruption was noted over the shoulders, back, and extremities. The throat was congested and the left anterior cervical nodes

3. Dingle, J. H., Thomas, L., and Morton, A. R.: Treatment of Meningococcic Meningitis and Meningococcemia with Sulfadiazine, *J. A. M. A.*, 116:2666-2668, 14 June 1941.

were enlarged and tender. A soft apical systolic murmur was present. Both ankles and left elbow were red and slightly tender without visible swelling. The temperature was 102.6° F., the pulse, 108, and the respiration, 20. The white blood count was 17,400 with 76 percent polymorphonuclears. The sedimentation rate was 25 mm. in one hour. As the diagnosis at this time was acute rheumatic fever, salicylates were administered, but the patient did not improve. The temperature curve resembled that of tertian malaria with typical chills followed by a rise in temperature to 103° F., sweating, then a drop in temperature to normal to be followed in forty-eight hours by another paroxysm. Tertian paroxysms continued until 16 April. With each paroxysm, a new crop of skin lesions occurred and on 11 April an erythematous lesion with a vesicular center appeared on the inner aspects of the lower third of both legs. On 16 April in spite of negative malaria smears, atabrine was given a therapeutic test with a slight lowering of the fever peaks, but the joint symptoms and recurring crops of skin lesions continued. On 17 April a blood culture was taken and on 26 April was reported positive for meningococcus type I.

Sulfadiazine treatment was begun on 28 April. The first dose was 4 gm. followed by 1 gm. every four hours for seven days. The temperature dropped to normal on 29 April and remained normal, and subsequent blood cultures were sterile. Joint pains continued in spite of bacteriologic recovery. After two months of convalescence the joint pains subsided without further treatment. He was discharged when recovery was considered complete.

CASE 3. A 26-year-old soldier, admitted to hospital on 14 April 1943, complained of pain in the muscles and tendons of his legs and a general skin eruption. At the onset eight days previously he noticed aching in the legs; on 11 April the pains in his legs became more severe, and on 12 April he developed a general eruption with fever and dizziness.

The patient was well developed and well nourished, oriented, and looked toxic but was not in acute distress. Three types of skin lesions were noted over the extremities and trunk. The Wassermann and Kahn tests and agglutination tests for typhus, typhoid, and undulant fever were reported as negative. Meningococcemia was suspected on admission but a diagnosis of erythema multiforme was made.

For ten days the patient had an irregular fever which would drop to 98° F. or 99° F. in the morning and rise to 102° F. or 103° F. in the afternoon. The skin eruption would fade and new crops would recur. On 17 April another blood culture was taken and was positive for the meningococcus on 27 April. The organisms agglutinated polyvalent serum but did not agglutinate with types I, II, or IIa. A blood culture taken on 23 April and a nasopharyngeal culture taken on 17 April 1943 were positive for the meningococcus. Sulfadiazine treatment begun on 28 April was continued for seven days. The temperature dropped to normal on 29 April and remained normal; subsequent blood cultures were sterile. The muscle pains continued for six weeks. He was discharged after complete bacteriologic and clinical recovery.

CASE 4. A 24-year-old soldier, admitted to hospital on 10 May 1943, complained of feeling sleepy and of spots covering both legs. The onset sixteen days previously followed an injection of tetanus toxoid. The next day he noticed red spots on his legs and felt sleepy, which he attributed to the toxoid. The physical examination was negative except for fever and numerous pink maculopapules scattered over the trunk and extremities. A few macules with a petechial center were present. The temperature was 100° F., pulse, 80, respiration, 20. The white blood count was 14,550 with 78 percent polymorphonuclears. A provisional diagnosis of meningococcemia

was made at this time. Blood culture taken on admission and nasopharyngeal culture were positive for meningococcus type I.

Sulfadiazine therapy, begun on 14 May, was continued for five days. On 15 May no more lesions were apparent, the patient became afebrile and asymptomatic. Sulfadiazine was stopped on 19 May and the patient was discharged as recovered on 24 May.

CASE 5. A 28-year-old soldier, admitted to hospital on 23 April 1943, complained of headache, generalized aching, fever, chills, and sweats of one day's duration. He was a well-developed and well-nourished male who did not appear very ill. The mucous membranes of the throat and pharynx were moderately congested. The temperature was 101° F., pulse, 100, respiration, 22, and leukocyte count, 7,800 with 53 polymorphonuclears. A provisional diagnosis of acute nasopharyngitis was made.

On 25 April the patient felt well, his temperature was normal, and he desired to return to work. On 26 April his temperature rose to 101° F., and he complained of pain in the right ankle and knee. An eruption was present over the abdomen and extremities and on the left palm and the dorsum of the right foot. The rash consisted of faint pink macules which faded on pressure and ranged from 0.25 to 0.5 cm. in diameter. There were papules similar in color and size and some were indurated and tender resembling the eruption of erythema nodosum. Meningococcemia was suspected.

The fever would drop to 98° F. in the morning and rise to 99° F. or 102° F. in the evening. The eruption would fade and be followed by a new crop of lesions. The joint pains would subside only to recur, but at no time was there redness or swelling of the joints. On 3 May the blood culture was reported positive for meningococcus type I.

Sulfadiazine therapy, begun on 3 May was continued for five days. On 5 May the temperature became normal, the joint pains subsided, the rash gradually faded, and no new crops occurred. By 10 May the patient felt well and after one month's convalescence was discharged.

CASE 6. A 22-year-old soldier, admitted to the hospital on 15 March 1943, complained of headache, fever, and chilly sensations having come on the previous day. The patient was well nourished and did not appear acutely ill. Examination revealed a congested pharynx, small amount of thin watery nasal secretion, temperature, 101.2° F., pulse rate, 110, and no joint pains nor rash. The white blood count was 9,350 with 68 polymorphonuclears. The sedimentation rate was 26 mm. in one hour. A diagnosis of acute nasopharyngitis was made.

The patient remained fairly comfortable but the fever continued between 99° F. and 101° F. On 18 March he had pain and stiffness in both ankles and rheumatic fever was suspected. Salicylates had no effect. On 24 March the wrists and knees became painful but at no time was redness or swelling noticed. Salicylates were continued in doses of 120 grains a day with some relief of joint pains, but with no effect on the fever. On 29 March numerous slightly tender papules from 0.25 to 1 cm. in diameter and varying from faint pink to red appeared over the trunk and extremities. A few faint pink macules which faded on pressure were scattered over the trunk and extremities. A blood culture taken on 30 March was negative. Throat culture taken on 1 April was positive for hemolytic streptococcus. The patient continued to have daily irregular fever and joint pains.

The eruption would fade and be followed by a new crop of lesions. Meningococcemia was now suspected. A blood culture and nasopharyngeal culture taken on 17 April were positive for meningococcus type I. The white blood count was now 14,300 with 82 percent neutrophils.

On 28 April the patient received 4 gm. of sulfadiazine as the initial dose, followed by 1 gm. every four hours night and day for seven days. The temperature dropped to normal on 29 April and remained normal. The skin rash gradually faded. Three subsequent blood cultures and nasopharyngeal cultures were negative. The joint pains persisted. He was kept under observation for two months after which the joint pains subsided. He was discharged as recovered.

LABORATORY

The diagnosis of meningococcemia can be suspected on clinical findings, but to the laboratory falls the major responsibility of demonstrating the causative agent of meningococcal septicemia. Although in some cases isolation of the meningococcus from the blood is difficult, newer techniques and improved media offer a more reliable means for making a correct bacteriologic diagnosis.

Blood cultures should be made with discretion and not at the convenience of a technician. Blood cultures for growing meningococci are more often positive if the blood is drawn when the temperature is rising or at its peak. Blood cultures are often hindered because of the premature use of sulfonamides, which even in small doses will render blood unsatisfactory for reliable culture.

As culture material, heart infusion broth was satisfactory for our work. Good results have been obtained by planting a minimum of 10 cc. of blood in 150 cc. of heart infusion broth containing 1 percent agar and 1 percent procaine hydrochloride. Many cultures for the meningococcus become positive only after twelve days of incubation and in rare cases even longer. This is a longer incubation period than most routine cultures receive. Sufficient blood should be collected so that both aerobic cultures and cultures under increased CO₂ tension can be made. The use of a simple candle jar has been satisfactory.

Microscopic examination only of the broth culture can be misleading. Not infrequently smears made from bouillon will be negative; yet transplants from this same culture to chocolate agar will produce an abundant growth.

The meningococci isolated in this series were identified by specific serum agglutination and specific sugar reactions. The former, though satisfactory, may lead to error, for occasionally there is a cross agglutination in the Neisserian group. Other approved procedures are available.

Nose and throat cultures should be done on suspected cases. Chocolate agar plates streaked with material from deep within the throat and nose render good results.

The cellular response of the blood is practically always a moderate leukocytosis with a slight left shift in the shilling count. In one proved case of meningococcemia the blood count remained normal and showed no evidence of bacterial infection. Although the meningococcus has been demonstrated on plain smears taken from cases of acute fulminating meningo-

coccal septicemia, we were unable to find any organisms on smears made from the blood of these cases of chronic or sub-acute meningococcal septicemia.

Spinal fluid examinations were made on only two occasions. It is our opinion that lumbar puncture should be reserved for cases with signs of meningeal irritation. The fluid was negative in one patient. The second patient showed meningeal signs for a short period and the cultures made from the spinal fluid taken during this time were positive for the meningococcus. It is possible that organisms were picked up from the skin because this patient had a positive blood culture.

In attempts to isolate organisms from the skin lesions, several hemorrhagic areas were cultured. The material was obtained by scraping the lesion and streaking on chocolate agar plates. All such cultures and smears were negative.

Agglutinations by the patient's blood of suspended killed organisms failed to be of clinical value. We were unable to obtain agglutination above a 1:80 dilution.

The diseases which were considered important in the differential diagnosis were rheumatic fever, malaria, sub-acute bacterial endocarditis, typhus fever, gonorrheal sepsis, erythema nodosum, and erythema multiforme.

ACUTE FULMINATING MENINGOCOCCEMIA

Acute fulminating meningococcemia with or without meningitis is another form of meningococcic infection. Nine cases of this form have appeared at the hospital during 1942, 1943, and 1944. The clinical manifestations are dramatic and treatment is definitely effective. One patient died suddenly before the disease was recognized and one patient died suddenly twelve hours after treatment from pulmonary edema. The disease is so fulminating that one cannot wait for a confirmatory blood culture before instituting treatment.

Most of the patients were admitted with a diagnosis of acute nasopharyngitis. Suddenly they became moribund with symptoms and signs of peripheral circulatory failure and a general macular or petechial eruption or no eruption at all. Some of them were listless and semicomatose; others remained rational, and still others were disoriented, violent, and restless. A few patients gave no history of illness but were found in their barracks in a state of collapse. At present any patient showing a diffuse petechial, purpuric, or macular rash, early coma, or marked restlessness with a leukocytosis is considered to have fulminating meningococcic septicemia. Meningeal symptoms or symptoms of meningeal irritation are not necessary for diagnosis. Lumbar puncture may reveal a normal fluid or may reveal up to 400 white cells, mostly polymorphonuclears. Smears from the fluid may reveal no organisms and yet numerous meningococci will be seen on culture. The blood culture is usually positive for meningococci. In four patients the diagnosis was immediately confirmed by

demonstrating gram-negative diplococci in a film of tissue juice obtained by cutting into a petechia. In every instance the diagnosis was confirmed by one or all of these methods.

We were unable to determine the presence of hemorrhage into the adrenal glands. The two patients who died did not show hemorrhage into the adrenals at necropsy. Thomas,⁴ who reported on forty-nine fatal cases of fulminating meningococcemia that came to necropsy, reported three cases clinically indistinguishable from Waterhouse-Friderichsen cases. Although the clinical course of this disease is similar to the Waterhouse-Friderichsen syndrome, we have not diagnosed our cases as such.

The clinical picture and therapy are indicated in the following case reports:

CASE 1. A 20-year-old soldier, admitted to hospital at 9:00 p.m. with a history of head cold for one day and fever with chills, had a temperature of 100° F. and a large ecchymotic spot under the right eye. Nothing more of importance was found. At 8:00 a.m. the temperature had risen to 105° F., and there was a generalized ecchymotic rash which immediately suggested a meningococcic infection. Lumbar puncture revealed fluid as not under increased pressure. The white cell count in the spinal fluid was 165 per cu. mm. with 95 percent polymorphonuclears. A smear revealed numerous gram-negative diplococci which on culture were found to be type I meningococci. The white blood count was 35,000 per cu. mm. with 94 percent polymorphonuclears. The blood culture was positive for meningococcus type I.

At 10:00 a.m. the patient was in profound circulatory failure, cold, clammy, with a rapid barely perceptible pulse, and with blood pressure 60/20. He was conscious and rational.

One thousand cc. of one-sixth molar sodium lactate⁵ solution in normal saline were given intravenously. The oxygen tent with an oxygen concentration of 45 percent was started. Five gm. of sodium sulfadiazine in 100 cc. of sterile distilled water were administered intravenously and 5 gm. of sodium sulfadiazine in 15 cc. of sterile distilled water were given intramuscularly⁶ as soon as the one-sixth molar sodium lactate had been administered. This was followed by 20,000 units of meningococcus antitoxin intravenously after tests for serum sensitiveness. Antitoxin was repeated every six hours for three more doses. Ten cc. of adrenal cortical extract were given by vein and 10 cc. intramuscularly. Adrenal cortical extract⁴ was given every two hours until the shock was overcome. Five hundred cc. of plasma were given two hours after the one-sixth molar sodium lactate solution had been given. Three hours after the beginning of therapy 1,000 cc. of one-sixth molar sodium lactate in normal saline were again given by vein. Five hours later 1,000 cc. of 5 percent glucose in normal saline were given intravenously. This was followed by 5 gm. of sodium sulfadiazine in 15 cc. of sterile distilled water intramuscularly.

At 7:00 p.m. the pulse was 120 per minute, the blood pressure was 100/60, and six ounces of urine were excreted. The adrenal cortical extract was reduced now to 2 cc. every two hours. The next morning the pulse was

4. Thomas, Henry M.: The Treatment of Fulminating Meningococcic Infections, Bull. U. S. Army M. Dept., 73:78-84, February 1944.

5. Ochs, Louis, and Peters, Michael: Management of Meningococcic Infections at the Station Hospital, Fort Benning, Georgia, War Medicine, 4:599-605, December 1943.

6. Hall, L. T., Thompson, Edward, Wyrens, R. J., Harris, A. M., and Wilder, Violet: Parenteral Use of the Sulfonamides; A Clinical and Experimental Study, Ann. Int. M., 17:835-841, November 1942.

80 per minute, the blood pressure, 110/70, and urinary output had been 1,200 cc. for the night. The patient complained of severe headache. Examination revealed a stiff neck and positive Kernig signs. A spinal puncture was done and 30 cc. of cloudy fluid, under a pressure of 550 millimeters of water, were removed. The white cell count was 21,000. He was given 1,000 cc. one-sixth molar sodium lactate solution intravenously, 5 gm. of sodium sulfadiazine solution intramuscularly, and 20,000 units of antitoxin intravenously. At eight-hour intervals he was given 1,000 cc. 5 percent glucose in saline by vein. The next day the patient was given sulfadiazine 1 gm. every four hours with 3 gm. of sodium citrate (to alkalinize the urine) with each dose of sulfonamide. The pulse and temperature returned to normal at the end of ninety-six hours and by the seventh day of illness all medication was discontinued. Fifteen days after the onset of his illness the large areas of ecchymosis sloughed out leaving large craters. These healed promptly without any treatment. Except for a severe serum sickness, manifested by urticaria and swollen painful joints, he made a complete uncomplicated recovery and two months after admission returned to duty.

CASE 2. An 18-year-old soldier was found comatose in his bunk at 9:00 a.m. A friend stated that he had felt sick before going to bed the previous evening. Examination revealed the patient was in profound circulatory failure with cold, clammy skin, imperceptible pulse, and unobtainable blood pressure readings. The rectal temperature was 96° F. The white blood count was 47,000 with 95 percent polymorphonuclears. A blood culture was positive for meningococcus type I.

A diagnosis of fulminating meningococcemia was made and the patient was treated for the first twenty-four hours as outlined for case 1. At 4:00 p.m. the pulse was perceptible and the rate 140 per minute. At 7:00 p.m. the blood pressure was 80/60, temperature, 104° F., and the pulse rate, 120. The urine output had been 16 ounces between 4:00 p.m. and 7:00 p.m. The next morning he was still semicomatose, blood pressure was 100/64, the pulse, 110, urine output, 75 cc. per hour for the preceding twelve hours. Oxygen was discontinued and one 20,000-unit dose of antitoxin was given intravenously and cortical adrenal extract was reduced to 2 cc. every four hours. One thousand cc. of one-sixth molar sodium lactate solution were given intravenously and 5 gm. of sodium sulfadiazine intramuscularly. At eight-hour intervals he was given 1,000 cc. 5 percent glucose in saline intravenously. The spinal fluid was under 140-mm. pressure (water) and clear; a white cell count showed two lymphocytes and the smears and cultures were negative.

On the third day he was awake but not able to take sufficient fluid orally to maintain a urinary output of 1,500 cc. or over. He was given 1,000 cc. one-sixth molar sodium lactate solution intravenously. Sulfadiazine was administered orally 1 gm. every four hours with 3 gm. of sodium citrate with each dose. Pulse rate was 90, temperature, 100° F., blood pressure, 110/70. Signs of pneumonia in the left lower lobe were found and confirmed by x-ray. We were unable to isolate organisms from the sputum for a bacteriologic diagnosis. On the sixth day all medication was stopped and the patient made an uneventful recovery.

CASE 3. An 18-year-old soldier was admitted to the hospital at 1:00 p.m. complaining of fever and generalized aching of sixteen hours' duration. Examination revealed a temperature of 103° F. and an injected pharynx. At 5:15 p.m. he was found in a state of shock, with pulse, 130, blood pressure, 80/40, marked pallor, and a generalized petechial rash. A diagnosis of fulminating meningococcemia was made. A blood count revealed 23,300 white cells with 90 percent polymorphonuclears. A blood culture was

negative. The spinal fluid was under 170 mm. of pressure (water), clear and contained one lymphocyte per cu. mm. Cultures and smears from the fluid were negative.

At 2:00 a.m. the patient was comatose and restless. The pulse rate was 80 per minute, the blood pressure, 80/40, and the temperature, 105° F. At 8:00 a.m. the pulse rate was 40 per minute, the blood pressure, 104/60, and urinary output had been 900 cc. since admission. The spinal fluid was under 650 mm. of pressure (water) and cloudy. White cell count was 34,000 with 95 percent polymorphonuclears. The smear revealed intracellular and extracellular diplococci. The spinal fluid grew type I meningococci.

Two thousand cc. one-sixth molar lactate solution in normal saline and 1,000 cc. 5 percent glucose in saline were given intravenously during the next twenty-four hours. Cortical adrenal extract was reduced to 2 cc. every four hours. No further antitoxin was given. He was given 5 gm. of sulfadiazine intramuscularly. The patient remained disoriented for three days and treatment was carried out parenterally as described for the second twenty-four hours. On the fourth day he awakened and took fluids and sulfadiazine orally. On the seventh day all medication was stopped. On the twentieth day he developed a mild serum sickness manifested by urticaria which disappeared in twelve hours. He made an uneventful recovery.

The problem of treating fulminating meningococcic infections resolves itself into the treatment of the toxemia, bacteremia, and peripheral circulatory failure. An attempt to combat the toxemia with meningococcus antitoxin should be made. Early adequate amounts of antitoxin are of value in neutralizing meningococcus toxin, prolong life, and give chemotherapy a chance to rid the body of the organisms. Bacteremia can be successfully combated by giving early and adequate amounts of sulfadiazine intravenously and intramuscularly. Preparatory hydration and alkalization of all patients are carried out by administering one-sixth molar sodium lactate intravenously, thus reducing drug crystalluria. The treatment of shock in meningococcus infections should be carried out with caution because of the danger of pulmonary edema. Fluids should be given slowly and spaced over six- to eight-hour intervals. Adrenal cortical extract is employed whether or not there may be any lesion of the adrenal glands. Plasma is used intravenously and may be repeated in four hours if shock persists.

SUMMARY

Chronic meningococcemia is characterized by irregular fever, arthralgias, myalgias, and a skin eruption which may be faint red macules, faint red papules, petechial or large hemorrhagic lesions, the most characteristic lesion being a a rose-colored macule with a pinhead-sized vesicular, pustular, or petechial center.

Acute fulminating meningococcemia is characterized by a rapid, dramatic onset of peripheral circulatory failure and a generalized petechial or macular rash or absence of rash.

Outline of treatment of acute fulminating meningococcemia follows: one-sixth molar sodium lactate solution in normal saline; sodium sulfadiazine intravenously and intramuscularly; adrenal cortical extract intravenously and intramuscularly; meningococcus antitoxin intravenously; 5 percent glucose and saline intravenously; sodium citrate given with sulfadiazine orally; oxygen; recording of blood pressure, pulse, pulmonary signs for pulmonary edema, and urinary output every two or three hours.

False Positive Serologic Reactions for Syphilis

Report of 100 Cases Following Routine Immunizations and Upper Respiratory Infections

MAJOR A. B. LOVEMAN

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Syphilologists and serologists have recognized for years occasional false positive serologic reactions for syphilis which were frequently attributed to a few other diseases. Serologic tests have become so universally employed in industry, public health, and the armed services that many more cases of false positive reactions have been encountered.

Barnard¹ in 1940 reported false positive serologic reactions for syphilis following vaccination for variola. Since Moore^{2,3} called attention to such reactions, several papers have been published on this subject.⁴⁻⁸ Incl. Arthur,⁵ who studied cases following routine Army immunizations, concluded that as a group such immunizations were responsible for temporary changes in the Kahn reaction in 14.8 percent. Such changes persisted for from one to two months. Lubitz⁶ emphasized the importance of such reactions and his statistics (13 percent) are almost identical with the above. A positive serologic test may be expected, he says, up to the fifth month following vaccination but in all instances it will subsequently return to negative. The role played

The staffs of the Laboratory Service, Station Hospital, Fort Jackson, South Carolina, and the Division of Serology, Army Medical School, assisted and co-operated in carrying out these studies.

1. Barnard, R. D.: False Positive Serologic Tests for Syphilis; Following Vaccination for Variola, *Illinois M. J.*, 77:78, Jan. 1940.

2. Biological False Positive Tests for Syphilis, *Ann. Int. M.*, 14:1, July 1940.

3. Moore, J. E., Eagle, H., and Mohr, Chas. F.: Biologic False Positive Serologic Tests for Syphilis; A Suggested Method of Approach to Their Clinical Study, *J. A. M. A.*, vol. 115, 9 Nov. 1940.

4. Lynch, Francis W., Boynton, Ruth E., and Kimball, Annie C.: False Positive Serologic Reactions for Syphilis Due to Smallpox Vaccination (*Vaccinia*), *J. A. M. A.*, 117:591-595, 23 Aug. 1941.

5. Arthur, Robert D., and Hale, John M.: Biologic False Positive Tests for Syphilis Associated with Routine Army Immunizations, *The Military Surgeon*, vol. 92, No. 1, January 1943.

6. Lubitz, Joseph M.: Serologic Reactions Following Smallpox Vaccination, *Proc. Inst. M. Chicago*, 14:343-344, 15 Feb. 1943.

7. Kline, Benjamin S.: Under What Indications Should Serological Tests for Syphilis When Positive Be Repeated by Several Techniques, i.e., Including Complement Fixations and Flocculations at Least One of Which Is Quantitatively Titled in Order to Evaluate Whether a Positive Serum Reaction Is True or False, *Ohio M. J.*, 39:439, May 1943.

8. Favorite, C. C.: Effects of Smallpox Vaccination (*Vaccinia*) on Serologic Tests for Syphilis, *Proc. Soc. Exp. Biol.*, N. Y., 14:397, 1943.

by upper respiratory infections in producing false positive serologic reactions has been mentioned by Moore,⁹ Rein,^{10 11} and others, but it has not received the attention it deserves.

PLAN OF STUDY

In December 1942 and January and February 1943, there was a moderately severe epidemic of upper respiratory infections (nasopharyngitis) at Fort Jackson, South Carolina, for the most part in troops who had recently received their routine Army immunizations. We saw in consultation many of these patients with positive serologic reactions for syphilis. Such a group afforded an excellent opportunity for further studies, and the following plan was devised. A complete history and a thorough physical examination were made.

If a false positive serologic reaction was suspected, the patient was advised to have a quantitative Kahn and Wassermann done. Further hospitalization awaiting serologic data and further investigations were not required, and as soon as the primary condition which required hospitalization permitted, the patient was discharged, to be followed in the urologic outpatient clinic. Quantitative Kahns, whenever possible, and Wassermanns were performed weekly for at least a month and thereafter at one- to two-week intervals as long as necessary. The Kahn verification test was done whenever feasible, and some specimens were sent to the Army Medical School for special tests.

Patients were followed for at least a month; then another physical examination was made and the case reappraised. If the serologic test was still positive or if sufficient time had not elapsed since the last negative test, the patients were followed further (some as long as six months) until a definite decision could be given as to the presence or absence of syphilis. Every patient was examined and followed up by the author. Some aspects of this report naturally are more accurate than others. Whether the vaccination for variola "took," the exact time from the first immunization to the appearance of the first positive serology, and the history of previous blood tests are factors subject to error and should be taken for what they are worth.

When the study began, the Kahn test was the only serologic test done in our laboratory. Although all patients eventually had

9. Mohr, C. F., Moore, J. E., and Eagle, H.: Biologic False Positive Serologic Reactions in Tests for Syphilis; Occurrence in Diseases Other Than Syphilis. *Arch. Int. M.*, vol. 68, pp. 1161-1178, Dec. 1941.

10. Rein, Charles R.: Discussion of Article by Lynch, Frances W., et al.

11. Rein, Charles R.: Personal communication.

Wassermanns performed, only a little over one-half had both tests done simultaneously. This preliminary report covers our first 100 cases. We have now seen more than 125.

Every case used statistically in this report has had at least two initial positive serologic tests and from two to twenty tests during their follow-up period. At least two negative Kahns and two negative Wassermanns were required before these patients were discharged.

TABLE I

	Yes	No	No data
History of penile lesion or venereal disease of any sort excluding gonorrhea	2	97	1
History of gonorrhea	4	95	1
History of primary "take" type of vaccination for variola	71	18	11
History of recent nasopharyngitis or upper respiratory infection and history of recent immunization*	86	13	1
History of previous negative serologic tests for syphilis	93	0	7
History of negative serologic tests for syphilis when inducted	85	0	15

*This also includes several cases of bronchitis and atypical pneumonia.

ANALYSIS OF DATA

From an analysis of the above cases (table I) it can be seen that 97 percent denied all penile lesions and only 4 percent gave a history of having had gonorrhea. Thus 94 percent denied either penile lesions of any sort or history of venereal disease. Interrogation of these patients was not dismissed with a mere "Have you ever had a sore on your penis?" Each man was questioned very carefully using the appropriate terminology to suit the occasion. Thus we cannot escape the fact that a carefully taken history is of inestimable value in such cases.

Eighty-six percent of our cases gave a history of some upper respiratory infection but also a history of recent immunizations. Although it was not possible to state with absolute certainty which factor was responsible for the false positive serologic reactions, we feel that Army immunizations played a more important role than did upper respiratory infections. The reasons for this are discussed later. Those who were immunized and did not enter the hospital, did not, except in very few cases, have any occasion for serologic testing. Similar cases, however, furnished

the basis for Arthur's report⁵ in which it was revealed that 14 percent gave false positive serologic reactions for syphilis. Only 4 percent of our cases had upper respiratory infections without a history of recent immunizations and about the same percentage (5 percent) gave an immunization history without any history of a recent upper respiratory infection.

The term, upper respiratory infections, is used rather loosely throughout this paper, although in most cases this implies a nasopharyngitis, an occasional case of bronchitis, or atypical pneumonia. Other causes of hospitalization which may have contributed to our false positive reactions can be seen in table II.

Seventy-one percent of our cases revealed either that their vaccination for variola "took" or else they presented confirmatory signs of the above. In 18 percent there were immune reactions. Thus there seems to be some relation between the type of reaction and the development of false positive reactions. This is not a new observation.

TABLE II

Cases hospitalized other than upper respiratory infections

Diagnosis	Number of cases	Diagnosis	Number of cases
Urethritis	1	Tonsillitis	1
Fracture	1	Swollen left knee	1
Measles	4	Hemorrhoids	1
Infectious mononucleosis	1	Meningitis	1
Unknown	3	Cellulitis	1
Mumps	3		

Some of these patients gave a history of recent upper respiratory infection.

The average time from the first immunization to the appearance of the first positive serologic reaction was 32 days. The longest number of days was 120 and the shortest 5 days. The reason that 120 days was the longest is explained by the fact that if the patient did not recall being immunized within the four-month period it was not considered a "recent" immunization. Undoubtedly some of our patients had positive blood tests for many days before they were detected by routine serologic tests. Rein¹¹ has shown that the average negative phase is approximately 12 to 14 days following the vaccination.

The past serologic data are a most important feature of the patient's history provided they are accurate. Ninety-three percent of our patients were certain that they had negative serologic tests for syphilis in the very recent past, and 85 percent were reasonably sure that their tests were negative when inducted.

The Kahn Verification Test¹²

Unfortunately we have not performed this test on enough cases to form a definite opinion of its value. The test was done on only 18 cases, 11 of which were reported as false positive biologic type of reactions. Two cases were reported as true syphilitic type of reaction; in 3 cases the results were inconsistent, and in 2 the tests were positive at both 0° C. and 37° C. Kahn's original technique was followed in performing these tests. He has since modified the above procedure, and it is understood the results are more conclusive. Some of our blood specimens were sent to the Army Medical School, where each was subjected to a battery of diagnostic tests in addition to a special preliminary verification procedure. As in the Kahn verification series, not enough of these tests were performed for us to form any opinion as to its true value, although the results were most encouraging. We plan to continue these studies with the Army Medical School in the near future.

It is perhaps safe to conclude that no verification test yet perfected is capable of distinguishing between true and false syphilitic type of reactions in all cases. Yet this should not prevent us from employing these tests as additional information in our attempts to arrive at an accurate diagnosis.

The Kahn Quantitative Test

Quantitative Kahn tests were performed in one-third of our cases. In 81 percent the titer was less than 20 units. One-third had a titer of less than 2 units. The highest titer of any of our series was 80 units. In all but one of our cases there was a gradual dropping of the titer until the final test became negative. The serologic titer, in our opinion, is of real importance in attempting to differentiate between true and false positive reactions. Usually a low titer is more indicative of a false positive type of reaction whereas a high titer is very suggestive of a true syphilitic type. Kline⁷ also feels that the titers in nonsyphilitic

12. Kahn, Reuben L.: A Serologic Verification Test in the Diagnosis of Latent Syphilis, *Arch. Derm. Syph.*, Chic., 41:817-830, May 1940.

cases tend to be lower than in cases of syphilis. Lubitz,¹³ however, is of the opinion that the reagin titers in the false positive reactions for syphilis are as high as those in syphilitic sera, although the former disappear very quickly on standing, and that the reactions become negative 14-104 days after vaccination. In false positive reactions the titer will usually drop without any treatment until the test itself becomes negative. In a true syphilitic type of reaction the titer as a rule either remains the same or increases gradually from week to week. The above observations have been stressed previously by both Kahn¹⁴ and Moore.³ Owen, Brooks, and Tucker¹⁵ conclude similarly about the Wassermann reaction stating that if the titer remains constant or rises that suspicion of a syphilitic type of reaction should be entertained. Kline⁷ goes further by stating that a rapidly increasing titer is indicative of early syphilitic infection. He concludes in addition that when there is no marked variation in the reagin with repeated positive reactions that syphilis is also probably present. He no doubt implies that this is true in latent or occult syphilis and with this we heartily concur. It is not unusual, however, to find low titers in old treated cases of syphilis as well as in asymptomatic syphilis of long duration. It was in this group of cases that the serologic "pattern" frequently fluctuated from positive to negative to positive. This proved of definite value to us in differentiating these cases from false positive reactions, and is discussed in more detail later.

Kahn vs. Wassermann Test

When these investigations were first undertaken, only the Kahn serologic test was done in our laboratory and so only 58 cases had both the Kahn and Wassermann tests done simultaneously. All cases, however, eventually had a Wassermann done and for the past five to six months simultaneous tests have been performed in these cases. Of the 58 cases, 34 (58 percent) had positive Kahns and negative Wassermans. Twenty-three cases, however, had both tests positive (39 percent) and only one patient had a positive Wassermann and negative Kahn test. Since these statistics have been compiled, we have encountered another such case. Thus in appraising the above tests in our series of cases we find that both give false positive reactions but that as

13. Lubitz, Joseph M.: Serologic Reactions Following Smallpox Vaccinations, *Am. J. Clin. Path.*, 13:139, March 1943.

14. Kahn, R. L.: Facts Regarding the Quantitative Kahn Reaction, *Vener. Dis. Inform.*, 20:255, Sept. 1939.

15. Owen, May, Brooks, Rengy, and Tucker, LaMonte: Laboratory Observations on the Non-specific Wassermann and Prezone Reactions, *Texas J. M.*, 38:714, April 1943.

the tests were performed in our laboratory the Wassermann revealed fewer false positives than did the Kahn. Similar conclusions were reached by Cardon and Atlas,¹⁶ who studied a group of cases of false positive reactions for syphilis associated with hyperproteinemia. They were of the opinion that the Kahn and Kline flocculation tests gave false positive reactions more frequently than the complement fixation tests. Lynch⁴ in his series of cases also reported that the Kolmer-Wassermann test proved more specific. It is conceivable that in our laboratory some of the false positives could be the result of employing a very potent high-titered antigen.

We were unable to secure any data as to which test became positive first, although the Kahn remained positive for a longer period. The average duration of a positive Kahn was 25 days; that for a Wassermann 16 days. The longest duration for a persistently positive Kahn in our series was 184 days, whereas the longest Wassermann was 70 days. We have since, however, followed a patient whose Wassermann was positive five months after the initial positive serologic test. The Kahn test was consistently negative. This case is not included in our statistical report. Further data on the duration of the positive Kahn may be seen indirectly in the following. In 43 of our cases the Wassermann tests were taken soon after the Kahns had become negative. The Wassermans were all negative.

Rein in a personal communication to the author stated that at the Army Medical School his findings showed that the Wassermann test was the first to become positive in upper respiratory false positives and the last to reverse. As mentioned above, we cannot state with accuracy whether our cases were the result of upper respiratory infections or Army immunizations, but we can state that the Kahn test as performed in our laboratory remained positive for a longer period than did the Wassermann. This, together with the fact that our patients gave more positive Kahn than Wassermann reactions, may indicate that these were due to vaccinations rather than upper respiratory infections.

The Serologic "Pattern"

By repeating serologic tests at frequent intervals we had an excellent opportunity for studying the pattern or "type" of both the syphilitic and nonsyphilitic reaction.

16. Cardon, Leonard, and Atlas, Donald H.: Biologic False Positive Reactions for Syphilis Associated with Hyperproteinemia; Preliminary Report, Arch. Derm. Syph., Chic., 46:713, Nov. 1942.

In our series, the false positive type as a rule became positive or negative either gradually or suddenly but did not usually undergo "inconsistent inconsistencies" or fluctuating stages of positivity and negativity. The latter practically always indicated fluctuations in cases of true syphilis and is probably the result of varying amounts of small but detectable reagin circulating in the blood. In our cases of false positives when the reagin became such that it was not detectable and the test was negative, it seldom reverted back to positive. Such may occur, however, for we had two cases whose serologic reactions had become negative but who had not yet completed all of their immunizations. When further immunizations were given in these patients the serologic tests again became positive. These, however, returned to negative very rapidly and maintained this stage. An occasional fluctuation was noted in several other cases, but this did not occur nearly so frequently as in cases of syphilis, especially those with a low titer. Rein,¹¹ however, disagrees with our findings and is inclined to feel that the reverse may also be true. He goes further to state that, "It is not uncommon to observe fluctuations of serologic titer in false positive reactors. This may be due to the effect of intercurrent infections and metabolic disorders on a 'labile' globulin fraction in their blood."

Kline⁷ shares a similar opinion with Rein, especially with regard to the more sensitive flocculation tests, for he states that tests which are discrepant and fluctuating with a rapid return to negative probably indicate a negative condition (false positive reaction). Possibly both views are correct and our results lend further evidence to the fact that our false positives were for the most part the results of Army immunizations rather than upper respiratory infections. Their results may well represent false positive reactions in general, some of which may have been from immunizations taken early, before the patients had completed all of their injections, or else resulting from upper respiratory or other types of infections. It is easily conceivable that serologic reversals from positive to negative to positive (fluctuating types) may occur with respiratory relapses or with any other type of infection known to produce false positive reactions. On the other hand, it seems less likely that fluctuations from positive to negative to positive again should occur after a maximum titer has been reached following immunizations unless further injections are given. In our series this rarely occurred and when the serology finally became negative it usually maintained this stage.

Practically all of our cases had their initial serologic examinations performed after they had completed their immunizations and thus this may also help to explain the discrepancy between our findings and those mentioned above. Had we taken the serologies earlier, perhaps more fluctuations would have been noted. These fluctuations were not confined solely to any one test but were found to exist in both the Kahn and Wassermann reactions. It was not unusual in such cases to observe at one time that a particular test would be positive and the other test negative, whereas at a later date the reverse situation would be true.

It is not to be implied from the above discussion that the usual syphilitic type of reaction is a fluctuating one. On the contrary, typical cases of untreated syphilis, have, as a rule, persistently positive serologic reactions. It is not unusual, however, to see the above-mentioned fluctuating types if the serologic tests are performed frequently and over long periods of time—especially if the reagin is present only in small amounts. This was further substantiated by the low quantitative titers in most of the cases under discussion.

Value of Physical Examination

In over 90 percent of our cases there was not the slightest evidence of either acquired or hereditary syphilis. About 10 percent of our patients revealed minor physical abnormalities which at the time could or could not be attributed to syphilis. Most of these were insignificant findings or unimportant suggestive stigmata of hereditary syphilis, such as high arched palate or prominent frontal bossae. Thus the physical examination as well as the history is most important in attempting to reach a decision in such cases as to the presence or absence of syphilis. Spinal fluid examinations were rarely indicated but were negative in those upon whom they were performed. One patient not included in this series was diagnosed hereditary syphilis by another examiner because of a few minor stigmata and a positive Wassermann reaction. Subsequent studies failed to substantiate such a diagnosis, and after five months' observation the serologic tests became and remained negative. As such cases of false positive reactions are very important to the person involved, extreme caution should be taken before making an out-and-out diagnosis of syphilis.

DISCUSSION

The value and adequate appraisal of an accurate history and thorough physical examination in these cases were most obvious. Many of us would do well to recall the teachings of our preceptors who expounded the principle that when the laboratory reports do not coincide with the clinical findings, as a rule, the laboratory is wrong. On each consultation reply we attempted to commit ourselves as to whether or not the individual patient had syphilis. This was based entirely on the evidence at hand; namely the history, physical examination, and the positive serologic tests for syphilis. In well over 90 percent of the cases subsequent findings revealed the accuracy of this appraisal. We agree entirely with Mahoney,¹⁷ who stated, "It is only rarely that an arbitrary diagnosis of syphilis and the beginning of treatment are warranted upon the basis of positive serologic reactions in the absence of history and clinical findings of syphilis."

One might correctly ask then that if such is true what value are serologic tests in latent or occult syphilis? How else can such a diagnosis be made? Nothing could be more detrimental to the medical profession than to have the pendulum swing in the other direction and thus have repeatedly positive serologic tests for syphilis disregarded because of a denial on the part of the patient that he ever had the disease. Serologic tests are even more valuable today than ever before and certainly more accurate. We should still believe with conviction that any well-recognized test for syphilis which is repeatedly positive and performed in a good laboratory indicates syphilis until proved otherwise. This does not prevent us, however, from carefully investigating the patient and appraising the serologic data as it was so intended; namely, as additional information to be used accordingly with the other available data at hand. If the evidence points against a diagnosis of syphilis, nothing is to be lost by following such a patient for as long as six months, if necessary, before instituting therapy. In most cases the diagnosis will be settled in a much shorter time, and as a rule no treatment will be found necessary. The above advice holds true especially if there is a history of any conditions known to produce false positive reactions for syphilis. But adhering to the above, many innocent patients will be spared treatment for syphilis which they do not have, and many unknown causes of false positive reactions may be revealed.

17. Mahoney, J. F.: Discrepancies in Serologic Findings as Shown by the Results of the Washington Serology Conference, N. York State J. M., 43:843-847, 1 May 1943.

SUMMARY

1. One hundred cases of false positive serologic reactions for syphilis are reported.

2. Careful study of these cases reveals that they were probably the result of both routine Army immunizations and upper respiratory infections. It is felt that Army immunizations played a more important role than did upper respiratory infections.

3. Clinical evidence based on an accurate history and physical examination was more dependable than the initial serologic tests in differentiating syphilitic from nonsyphilitic patients.

4. No one serologic test had an over-all superiority over the other in differentiating true from false positive reactions. The Kahn test, however, proved less dependable than did the Wassermann.

5. In the series reported the Kahn test remained positive for a longer period than did the Wassermann.

6. Serologic false positive reactions for syphilis may remain positive for six months or longer.

7. The Kahn quantitative titer was of definite value in differentiating true from false positive types of reactions. Although not universally true, a high titer usually indicated a true syphilitic type of reaction, whereas a low titer was more in favor of a false positive biologic reaction. The gradual diminution of the titer without specific therapy practically always presaged an eventual negative test and thus indicated a false positive reaction. The increase in titer under similar circumstances was usually indicative of a true syphilitic type of reaction.

8. In these cases the pattern of the serologic data was important. A sudden or gradual drop from positive to negative which was maintained usually indicated a false positive type of reaction. In cases of syphilis, when the titer was high, the serologic reactions were usually persistently positive and did not fluctuate. In cases of syphilis where the titer was very low, it was not unusual to see fluctuations from positive to negative to positive. This so-called "pattern" was of definite value in differentiating the true from false positive types of reactions.

9. The Kahn verification test was performed on too few cases to form any definite conclusions as to its present value in differentiating true from false positive reactions.

10. The serologic test for syphilis should be used as it was intended; namely, as a link in the diagnosis chain for the detection of syphilis.

11. Although false positive reactions for syphilis have been encountered more frequently of late, the medical profession should not allow the pendulum to swing in the other direction and thus lose confidence in such tests. Any persistently positive serologic test for syphilis, today as formerly, should be considered as syphilis until proved otherwise.

Postoperative Problems Following Perforation of Colon

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An outstanding contribution to military medicine has been the reduction in mortality following traumatic perforation of the colon from 50 to 75 percent in this group of cases during World War I to about 30 percent in the present war. The morbidity rate, however, is still very high. Few of these patients recover without some complication such as wound infection, wound separation, evisceration, retraction of the colostomy, or the secondary abscess in the abdominal wall, peritoneal cavity, subphrenic space, and pleural cavity. Such complications lengthen the period of convalescence, often make it impossible to return the patient to duty in the theater of operations, and frequently jeopardize life.

While the primary purpose of the surgeon in the forward area is to save life, it seems probable that the morbidity rate can be definitely reduced without increase in the initial mortality. With the high incidence of wound infection in open wounds of the colon, the importance of all measures designed to decrease wound contamination and promote primary union cannot be overemphasized. From a study of twenty-one patients transferred to a general hospital in the Mediterranean area, it seems that following a perforating wound of the colon a most important factor in precipitating many of the complications is retraction of the colostomy. In seven patients, the colostomy stoma was at the level of the skin or beneath, and five of the seven patients had abscesses of the abdominal wall, adjacent peritoneal cavity, or the subphrenic space. One patient whose colostomy had retracted below the peritoneal level presented the following series of major complications: complete separation of the wound, abdominal wall abscess, retrocolic abscess, right pleural effusion, right subphrenic abscess, left pleural effusion, left subphrenic abscess, and empyema of the left pleural cavity. Another patient had a wound infec-

tion, retraction of the colostomy, an abdominal wall abscess, and wound necrosis with separation followed by evisceration. The latter of these patients arrived at a general hospital with a fever of 101° and a widely separated granulating abdominal wound. The abdominal wall abscess which he presented was drained and temporary improvement effected. His condition again became critical, however, because of the development of a right subphrenic abscess which, when drained, was followed by improvement until he suffered evisceration for the second time. Because of the tension incident to closure of the second evisceration, his wound separated again and he developed a jejunal fistula in the wound, requiring resection, end-to-end anastomosis of the jejunum, and a fourth attempt at closure of the abdominal incision. The wound is not yet fully healed although the patient is afebrile and improving rapidly.

The most important reason for retraction of a colostomy is the exteriorization of the bowel under tension. If there is tension on the bowel loops, they will inevitably retract. Exteriorization without tension, as well as formation of a spur long enough to permit subsequent extraperitoneal closure, is based largely on adequate initial mobilization of the bowel. By incising the line of fusion between the visceral and lateral parietal peritoneum, by liberation of the splenic or hepatic flexures where indicated, any segment of the colon from cecum to sigmoid can be readily exteriorized, in addition to permitting resection of several inches of bowel if necessary. The only blood vessels encountered throughout this dissection are a few at the hepatic and splenic flexures. With good anesthesia and adequate exposure, this usually can be carried out in a few minutes, for after division of the peritoneum, the mesentery can be easily mobilized to its central origin by sharp and blunt dissection of the loose areolar tissue on the posterior abdominal wall. When mobilizing the right colon, the right ureter and retroperitoneal second and third portions of the duodenum must be isolated and preserved. In freeing the descending colon, the left ureter must be found and reflected from the mesentery, and in liberating the splenic flexure, care must be taken not to injure the jejunum at the ligament of Treitz.

The ease and safety of the future restoration of intestinal continuity in these patients depends on the construction of a five- or six-inch double-barrelled colostomy spur. Having obtained mobilization, the rapid approximation of the two loops, using one or two rows of seromuscular sutures to unite the longitudinal bands, should not in most cases appreciably increase the operative risk. This will permit the division of the partition with safety and will ensure an adequate bowel lumen following the subsequent extraperitoneal closure. With ample length of spur in the first place and complete obliteration of the partition, these colostomies can be closed without fear of

postoperative leakage of intestinal contents. Although it was possible to close the colostomy in about 50 percent of our patients and to restore most of them to duty (Class "B") in this theater, the problem has been made more difficult and hazardous by the fact that the colonic loops were approximated by suture in very few of these patients. Since major intra-abdominal procedures for the restoration of intestinal continuity are not being performed in this theater, patients whose intestinal loops were widely separated and those in whom the bowel could not be approximated for a sufficient distance to permit extraperitoneal closure had to be evacuated to the zone of the interior. In cases in which closure was deemed feasible, gradual approximation of the two loops was accomplished, by careful clamping of the intervening partition. No deaths occurred among our colostomy patients, but at least 40 percent were in a serious condition at some time during convalescence because of secondary complications in patients already weakened by severe injury plus major abdominal surgery.

All efforts directed towards achieving primary wound healing, the exteriorization of the bowel without tension, and the construction of a double-barrelled colostomy of adequate length, whenever the existing circumstances permit, will keep down the mortality, decrease the period of hospitalization, and permit the restoration of more of these men to some type of useful duty.



Blood transfusion for horse given at clearing station of medical squadron, cavalry division. Signal Corps photograph.

Method for Instructing Medical Technicians

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Instruction in this school¹ has been in accordance with accepted Army standards with emphasis on demonstration and student application. However, with the increasing number of students sent to the school, and with the limited time available for instruction, the need was felt for a method of teaching that would more closely reach the individual student, thus assuring that he understands and is able to carry out correctly any designated procedure. Interviews have disclosed that the Medical Department is often hampered by enlisted men who prefer training in other arms or services. There is often a marked lack of interest. Furthermore, the educational qualifications of the students sent to our school have ranged from those of a fourth grader to college graduates. Intelligence as contrasted with education, however, has usually been good. The need for individual teaching is obvious. A new organization of instruction rather than a new method of teaching is presented.

Various sections of the room were cubicled by the use of overhead wire, sheets with grommets, and a number of hooks. This procedure required about a day's work and very little expense. Cubicles of various sizes and shapes can be speedily assembled and the room divided into numerous small rooms.

The number of students each month has varied from fifty-five to seventy-five. Seventy-two has proved ideal for our floor plan and method of division, thirty-six students comprising the morning class and thirty-six the afternoon class. We decided to divide each class into six groups and the work for the week into six units, each group working in a unit on a particular day. In six days, by a system of rotation, any group has worked in all six units.

1. Medical Section of the Medical Department Enlisted Technicians' School, Letterman General Hospital.

The course of instruction during the first three weeks consists of lectures, conferences, demonstrations, and periods of student application. The subjects included are anatomy and physiology, hygiene and sanitation, emergency medical aid, nursing, and ward management. With the beginning of the fourth week, the unit system comes into effect, and the room, by means of cubicles, is speedily converted into a Model Dispensary, figure 1. At the beginning of the fifth week the room is converted into a Model Ward with equal dispatch, figure 2.

The Model Dispensary Week has been included since it has been found that many of the graduates have been assigned this type of duty. Furthermore, after completing this week students work more efficiently during the Model Ward Week, and the latter in some of its aspects is in the nature of a practical examining of the former. For example, students during the Model Ward Week when asked to prepare a hypodermic or an enema tray are expected to do so on their initiative.

MODEL DISPENSARY WEEK

The following subject matter is covered in the six units during the Model Dispensary Week:

Unit 1—Emergency Medical Aid Section: Equipment consists of two Medical Department Field Chests (Nos. 1 and 2), litters, improvised splints, and teaching plasma units.

Students carry out on each other the various emergency procedures on types of cases encountered in a forward field installation (i.e., battalion aid station). Each student is given an opportunity to set up a plasma unit and administer the solution to a model plaster arm. The treatment of shock is stressed.

Unit 2—Instrument Identification Section; Foot and Ankle Section: In the Instrument Identification Section, students spend two hours, under personal supervision, learning the names, purposes, and methods of handling various ordinary instruments and suture material. They also must set up some of the commonly used instrument trays. In the Foot and Ankle Section students examine each other's feet. Prevention and care of common foot ailments and ankle injuries are stressed.

Unit 3—Gauze Folding and Equipment Section: Students fold gauze of various sizes; make sponges and applicators; sharpen knives, scissors, and needles; repair rubber gloves; etc.

Unit 4—Solution Preparation and Cleaning Section: During the first hour and a half students prepare, under close supervision, various commonly used solutions such as normal saline, boric acid, and disinfectants for routine ward use. Household measurements are stressed.

During the second hour and a half students clean different types of equipment, such as needles, syringes, rubber goods, and glassware. They also prepare such equipment for subsequent sterilization.

Unit 5—Sterilization Section: Students are given the opportunity to sterilize all types of equipment. Preferred and alternate methods are used to impress upon the student the necessity for adaptation under adverse conditions. Each student at this time also prepares and administers a hypodermic of normal saline.

Unit 6—Gas Warfare Treatment Section: Students act in turn as patients and aid men. They give each other emergency and early treatment for exposure to common chemical agents such as phosgene, mustard, and lewisite. The treatment of phosphorous burns is also included. They are instructed and given an opportunity to pass the nasal catheter. During most of the period the students wear their gas masks.

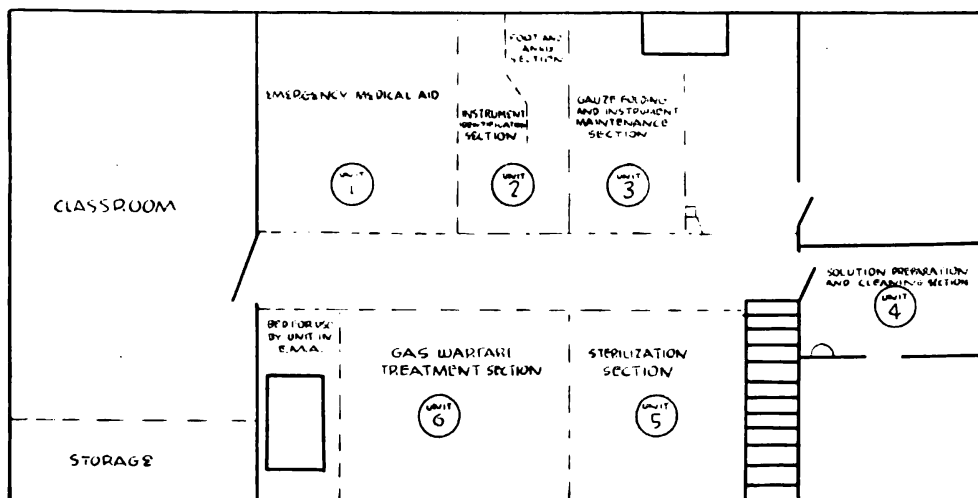


FIGURE 1. General floor plan showing position of cubicles for Model Dispensary Week.

MODEL WARD WEEK

By quickly shifting the cubicles from the arrangement used in the Model Dispensary Week, the room is converted into a small nine-bed hospital (see figure 2). Students act in turn as patients and attendants, and

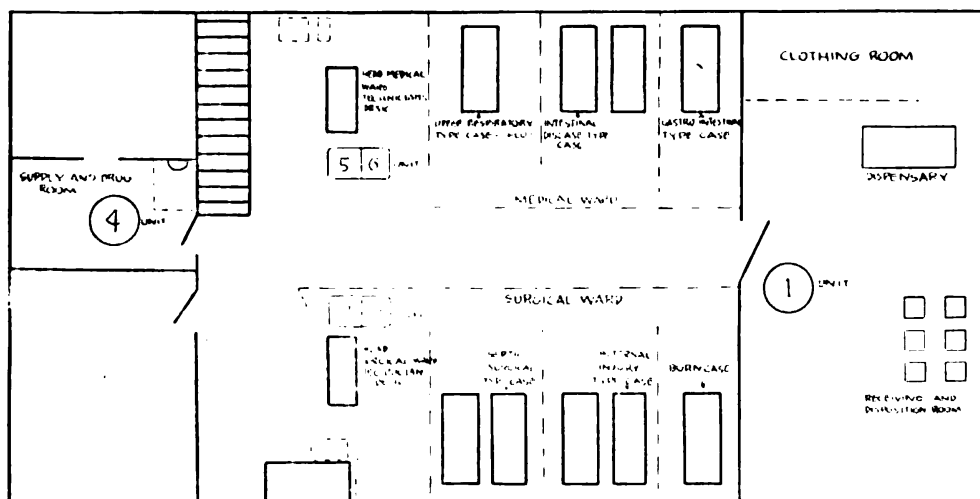


FIGURE 2. General floor plan showing position of cubicles for Model Ward Week (1st, 3d, and 5th days).

obtain an over-all picture of an Army hospital on a small scale. They carry out the various nursing procedures on each other and become familiar with commonly used paper work as it relates to patients and to ward supply.

The following is a description of the various units that comprise the Model Ward Week. (Figure 2)

Unit 1—Receiving and Disposition Office: Students act in turn as Receiving Clerk and patients, for a two-hour period. They fill out the necessary paper work relative to admitting a patient to the hospital.

Students work an additional hour in the Dispensary Room wherein a Model Sick Call is conducted.

Units 2 and 3—Surgical Ward: Three typical surgical cases are presented on the first, third, and fifth days; four different cases on the second, fourth, and sixth days. (See figure 2.) One student each day is designated a head ward technician, his work being comparable to the duties of a head nurse. He is responsible for the discipline, cleanliness, and smooth functioning of the ward. The other students act in turn as patients, attendants, and wardmasters.

Unit 4—Supply Section: Students take a physical inventory of the property in the Supply Room; they submit an Overage and Shortage Report; they are given a list of expendable and non-expendable property to requisition, using the Medical Department Supply Catalog. They are given other work to do relating to ward supply problems.

Units 5 and 6—Medical Ward: Three typical medical cases are presented on the first, third, and fifth days; three different cases on the second, fourth, and sixth days. (See figure 2.) The procedure followed in this ward is similar to that of the Surgical Ward. The use of cubicles on the Medical Ward is naturally of great value in teaching proper handling of infectious diseases.

SUMMARY

1. A new organization for instructing medical technicians has been presented, having as its basis the use of cubicles and the rotation of students, procedures, and cases. This allows the individual student to become thoroughly familiar with each procedure and case.

2. It is a method that involves very little expense and space. It is highly flexible, and no additional teaching personnel has been required.

3. The use of cubicles allows the maintenance of the class as a whole and yet at the same time its conversion into smaller units. An enlisted instructor is in charge of one or two such units. A medical officer instructor can pass freely from one unit to the other, thus assuring orderly functioning of all units.

4. Accepted mechanisms and methods of training are utilized to a high degree; namely, small groups, coach-and-pupil, application and demonstration at a maximum, practical examination, close contact between the instructor and the individual student.

Treatment of Mentally Disturbed Soldiers Overseas

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Medical Corps, Army of the United States
and

CAPTAIN PAUL D. MACLEAN

Medical Corps, Army of the United States

This general hospital in the South Pacific Area has a neuropsychiatric section in a group of wards in fire-resistant buildings adjacent to a field for recreation. The ward for disturbed patients will be discussed. This ward has, in one end, single "isolation" rooms for the more disturbed patients. The central part is a small ward for less disturbed patients. The part nearest the main corridor contains two private rooms for acutely ill patients. Near the main corridor are the doctor's office and the examining room. This floor plan has proved satisfactory.

The nurses and ward attendants are trained in the care of disturbed patients. This ward is of such size that every patient can receive more than the usual amount of individual attention. In any one day, the ward may be filled with disturbed patients who are incapable of dressing and otherwise taking care of themselves.

As soon as a patient is admitted, his condition is immediately appraised, provisional diagnosis is made, and a program for his treatment is outlined.

TREATMENT

No matter how disturbed a patient may be, it is assumed that some part of his personality is intact and every effort is made to appeal to him on that basis. His feelings of self-respect are considered from the beginning, and an attempt is made to treat him as any other sick person. The doctor, nurses, and ward attendants each try from the beginning to make the patient feel secure and at home. The personal factor, however, is not enough, and quiet and organization are essential in creating this atmosphere. The personnel of the ward help the patient to realize his share in this plan. Most of the patients are confused, dis-

The table of psychiatric diagnoses has been omitted.

oriented, thin, pale, and undernourished on admission. Their faces are tense, drawn, tired, and depressed. It is remarkable how much of their personality is restored in a few days. Each patient is given a bath, a shave, and clean clothing. Special attention is given to dental repair and oral hygiene and to the care of the feet. The treatment of mentally disturbed patients involves many factors—medical, psychiatric, and diversional. It is directed toward both the individual and the group.

The mentally disturbed soldier returning from combat in the tropics usually suffers from multiple ailments. In this respect he differs from the mental patient in a noncombat area or in civilian life. He usually manifests physical exhaustion from hardships in the field; he may have dengue, infectious jaundice, dysentery, hookworm, dermatitis, and "tropical sores." Such patients require, first of all, a high caloric diet, plenty of fluids, and supplementary vitamins, in addition perhaps to vermifuges or other medications.

Sedation. Sedative and analgesic drugs are by far the most effective means of treating disturbed patients in a military hospital. Most of them are suffering from an acute upheaval of the entire personality. The disturbance may have been coming on for a long time, but now it is severe. Most of them suffer from anxiety or mild depression or both. Some are inarticulate and simply tremble or shake. Some manage to suppress their symptoms outwardly but inwardly are tense and emotionally distraught. We have been liberal with sedatives on this service and start therapy with commanding doses.

Paraldehyde in ample doses is the drug of choice in the most disturbed cases. Twenty cc. are usually given by mouth as an initial dose. We never use it intravenously. The majority of patients will not object much to the taste, if it is mixed with milk or fruit juice. Occasionally it is necessary to intubate the totally uncooperative patient. It has not been found practical to administer this drug rectally. If the violent patient has not become quiet within thirty minutes, the drug may be repeated without undue risk from oversedation and depression of the respiratory center. Any patient who requires sedation to this extent, however, must be kept under vigilance with special attention to respiration and pulse rate. We do not hesitate to keep the overactive and noisy psychotic heavily narcotized with paraldehyde for several days—feeling that a sufficiently long suppression of his psychomotor activity may in itself help bring about a remission.

Hyoscine hydrobromide. We have used a great deal of hyoscine hydrobromide, alone for sedation or in conjunction with paraldehyde or one of the barbiturates when a prolonged quiet and dreamless sleep is desired. In doses of 0.25 to 0.50 mg., three times a day, hyoscine hydrobromide has been efficacious in controlling schizophrenic excitement. It has been our experience that hyoscine has less value in ameliorating the excitement of the manic-depressive.

Chloral hydrate and barbiturates. For the less disturbed cases, chloral hydrate or one of the barbiturates usually is sufficient to afford sedation during the day and sleep at night. Chloral hydrate (5 to 8 cc. of a 10 percent solution, t. i. d.) or phenobarbital (0.030 gm., t. i. d.) is usually sufficient for daytime sedation. At night 20 cc. of a 10 percent solution of chloral hydrate, or phenobarbital (0.1 to 0.13 gm.), should produce sleep within half an hour. These drugs are also used successfully in combination in certain conditions requiring deeper sedation.

Sodium bromide. We have found this drug valuable of itself, as a substitute for or an adjunct to these other drugs, especially in less severe disturbed states where mild sedation is desired over a period of time. We give it in the form of an elixir, 1.3 gm. (about 20 gr.), or more, three times a day. In this dosage over a period of several weeks we have not observed symptoms of intoxication or effects other than sedation to slight drowsiness, which was desired as a therapeutic effect.

Hydrotherapy. Warm baths are used in conjunction with sedation for excited patients. Because of shortage of personnel, wet packs have not been found practicable. It has been necessary to use physical restraints (canvas and leather jackets) only in the rarest instances.

Modified insulin shock. A modification of insulin shock therapy has been used in selected cases. This was introduced here by Captain Sidney J. Tillim, M.C., and is now being continued by one of us and Lieutenant David Crocker, M.C. This treatment promises to be helpful in an overseas hospital, particularly in early schizophrenia. In early schizoid reactions, there is some indication that this treatment may abort what might be a prolonged psychotic episode. Insulin appears to afford a marked sedative effect and to promote general physical improvement with a sense of well-being. It is typical to see patients who, because of their anxiety have been anorectic for a long time, develop voracious appetites and gain several pounds during a

week's treatment. Their tremors may subside and their extremities, which were cold and clammy, may resume a normal condition. Intractable headaches have been observed to disappear. Our opinion is that it is impractical here to institute insulin shock treatment in a psychosis where the prognosis is poor or in one which would require repeated courses of insulin over a long period of time. The modification of insulin therapy used here consists of administering insulin in doses, varying between 40 and 80 units, sufficient to produce symptoms of shock but not coma or convulsions. The dose is given within an hour after breakfast. If there has not been marked change or improvement in one week, this form of therapy is discontinued.

Psychotherapy. The relationship between the patient and the doctor or nurse on his ward is next in importance to sedation. The turnover makes it impossible to do extensive personal psychotherapy. The average stay of a patient in the psychiatric wards is seldom more than three or four weeks and may be as short as a few days. In a limited way, individual and group therapy has been utilized.

With the psychotic patient the most that can be done is to help establish his bearings and a general time-place-person relationship. The patient talks with his doctor for a short while every day. An effort is made to help him realize that he is sick, but that he is among friends and that he will improve. The nurse and the ward attendants, who are instructed in the psychotherapeutic point of view, cooperate with the medical officer. Some nurses and trained ward attendants have developed marked aptitude in gaining the confidence of frightened and disturbed patients and in reassuring them. It is striking to observe the rapid improvement of many of the psychotic patients after sedation, rest, and general supportive treatment together with strong suggestion and reassurance. In a few days many are able to leave their single rooms to be treated on the open ward. Some are able to go unescorted to the hospital mess, although when they first arrived at the hospital they had to be fed their meals in isolation.

The severely neurotic patients are given psychotherapy in the form of catharsis, suggestion, reassurance, and persuasion. This proceeds along basically simple lines. The patient is encouraged to talk freely about his difficulties. This sometimes relieves him. The role played by fatigue and strain, which are always present, and the rationale of his treatment—rest, food, sleep, and psycho-

therapy—are explained to him. In some hysterical patients, hypnosis sometimes is a quick means of getting at underlying material of a disturbing nature and is useful in relieving certain symptoms, especially nightmares, without making a prolonged approach through the conscious foreground.

Group psychotherapy. The nurses, ward attendants, and specially trained personnel play a very important part in group psychotherapy. Hardly less important is urging the improved patients to take an interest in and to help look after the more dependent. As soon as a patient feels pride in his ability to help other patients on the ward, his progressive convalescence is assured. For example, a convalescent patient will sometimes help feed a disturbed patient or will try to draw him out in conversation; or one patient may take another to the barber shop or for a walk. One patient who had training in physical education led the others in calisthenics.

To make the ward seem like home, emphasis is placed on pleasures emanating from the kitchen and from games. At mid-morning and mid-afternoon the improved patients prepare coffee, cocoa, and sandwiches and pass them around to other patients. This also serves the purpose of extra feeding which helps restore lost weight. Some patients like to make fudge in the ward-pantry or even bake bread or cakes, under the supervision of a nurse. The nurse plays checkers with some of the shy or seclusive patients, or she may encourage groups to play cards or games designed for a larger number.

One of the most successful forms of group psychotherapy is music, especially singing. Patients who are mute, negativistic, or emotionally apathetic may surprise one by breaking into a smile and actually singing if music is provided. This form of therapy proved so successful that arrangements were made to have music on this ward two afternoons a week; an accordion player and a pianist come regularly to the ward.

Ward attendants supervise patients well enough to play ball and other outside activities in the enclosed yard adjoining the ward. The attendants may escort patients on walks. Trips organized under the leadership of trained personnel include visits to various places, to the "movies," or to special entertainment in the Red Cross recreational hall. All able to do so are encouraged to go to church. On Sunday, outings to scenic parts of the countryside are routine for patients. Only the most disturbed patients are unable to take part in these group activities.

Occupational therapy. Some patients may start simple projects in woodworking, leather craft, bead and shell work, and basket making. Those who show special talent are provided with oils and water colors for painting. In some instances occupational therapy is brought to the bedside. Patients have been kept busy or diverted throughout the day and evening without incurring undue fatigue.

DISPOSITION

It is generally agreed that the soldier who has been through a psychotic episode or who has developed a severe neurotic disturbance is unsuitable for return to combat duty. Accordingly, all of these patients were returned to the United States for further treatment and disposition. To all appearances, a soldier may completely recover from a psychotic episode; yet it is probably fair to say that the underlying weakness in his personality has not been materially changed and there is always the risk that under the stress of military life, he may break again. The same statement with less emphasis seems true concerning the severely neurotic individual who, after rest and psychotherapy, makes a good recovery.

The fact that these patients are unfit for further combat duty, however, does not imply that their treatment can be postponed until they are returned to the zone of the interior. In many cases early intensive treatment will prevent what might be a prolonged illness. The refractory course of a severely hysterical patient who has been allowed to nurse his symptoms for several weeks is a case in point. Many neurotic soldiers who have improved after treatment, or have learned how to get along with their neuroses, could serve a useful purpose in a nontactical branch of the Army or take part in the war effort as civilians. To a lesser extent, the same may be said for the psychotic patients who have regained their sanity. And if one looks ahead, it is to be hoped that a great many of them can be happy and useful citizens and not be a drag on the government and their community as invalided or so-called "shell-shocked" cases.

It has not been possible to follow these patients after leaving this hospital; but on the basis of limited observations, it may be predicted that the majority of the manic-depressive psychoses and not a few of those with atypical schizoid reactions have a reasonably favorable prognosis. The majority of the patients admitted to this ward in a highly disturbed state have made marked improvement during their stay.

Clinical Notes

URETHRAL MEATOTOMY SIMPLIFIED

MAJOR ORMOND S. CULP

Medical Corps, Army of the United States

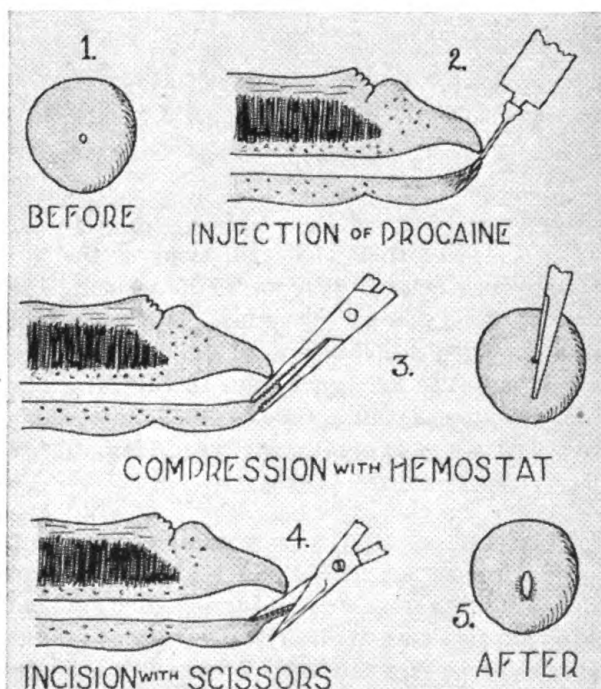
Meatotomy is recognized as the ideal treatment for marked constriction at the external urethral meatus and is far superior to instrumental dilatation alone. Although urethral meatotomy is easily performed, it frequently is followed by excessive bleeding from the extremely vascular glans penis and recurrence of the stenosis. Precautions taken to avoid these post-operative sequelae often result in prolonged hospitalization or frequent out-patient visits, which for military personnel is a serious problem. The purpose of this report is to outline a type of meatotomy which eliminates the common dangers and permits little or no loss of time from strenuous activity. The proposed regimen has the following advantages: hospitalization is unnecessary; the operative area does not bleed; there is little or no discomfort; minimal time is lost from duty; and the stenosis does not recur if routine instructions are followed carefully and completely.

Technique

The orifice frequently is too small for topical application of an anesthetic agent to the mucosa (figure 1). Although such anesthesia has been satisfactory in some instances, it usually is not complete. If the tissue around the small meatus is grossly infected, intra-

corporal injection of procaine is the anesthesia of choice.¹ In most cases local infiltration of the area to be incised is entirely satisfactory and safe. Only a few minims of 1 percent procaine are injected into the ventral edge of the meatus with a small hypodermic needle (figure 2). Complete anesthesia is instantaneous.

One "jaw" of a small, straight hemostat is inserted for the desired distance and the anesthetized tissue along the midline is clamped (figure 3). This zone of tissue is kept compressed for three to five minutes by locking the hemostat. After removal of the hemostat there is a narrow strip of compressed and avascular tissue along the midline. A small pair of scissors is introduced and this zone is divided, care being taken to keep the incision near the middle of the avascular tissue (figure 4). The lips



1. Magid, M. A., and Culp, O. S.: Ideal Penile Anesthesia, J. Urol., Balt., 50:508-513, October 1943.

of the meatus automatically spread without bleeding (figure 5). Whether or not an adequate orifice has been provided is determined by introducing a sound or bougie (usually 26F) which should pass easily. No sutures are employed.

Frequent dilatation is imperative until the operative area is entirely healed. This requires about ten days. Instrumentation is simple and may be done by the unit surgeon to save time. The interval between dilatations should not exceed three days and daily instrumentation may be advisable in some instances.

With this routine method of treatment and management no complications have followed, none of twenty-five patients on whom the procedure was tried had to be hospitalized, and all continued on full duty. Six-month checkups on the early cases have shown uniformly excellent end results.

RIFLE BULLET IN THE LUNG

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and

CAPTAIN HARRY G. HARDT
Medical Corps, Army of the United States

Conservatism in dealing with metallic foreign bodies in the lung is the watchword among surgeons. However, those who have had extensive experience with the veterans of World War I know that not a few men with retained metallic foreign bodies in the lung developed chronic suppurative pulmonary disease as a result. This, in many cases, did not develop until middle age when the veterans were less able to undergo thoracic surgery.

Case Report

This soldier, who was wounded in action in the South Pacific, was participating in an attack on an enemy strong point when fire from a hidden machine gun was suddenly encountered. He fell to the ground to escape this fire and, while lying in the prone position, was hit by an enemy sniper perched in a tree to his rear. The bullet entered the upper part of the left chest posteriorly passing through the scapula. The soldier immediately became very short of breath and coughed up some blood. During his evacuation from the battle area, his symptoms became less until at the time he came into our hands four days after his injury, he was entirely symptom free. Roentgenograms showed a rifle bullet in the left lung, with a partial pneumothorax (figure 1). Serial films showed an interesting shift in the position of the bullet as the upper lobe re-expanded (figures 1, 2, and 3). It was decided that the bullet should come out, and the operation was performed eighteen days after the injury.

Operation

Intratracheal differential pressure ether anesthesia was used. The usual anterior approach through the third interspace was made. The incision centered over the third interspace and extended from the left border of the sternum to the midaxillary line. The pectoral muscles were sectioned, the third and fourth costal cartilages stripped and divided near

the sternum, and the intercostal bundle incised close to the fourth rib. The pleura was opened over the length of the incision and rib spreaders applied. No adhesions, no blood, and no fluid were found in the pleural space. With the lung deflated, the bullet was palpated in the anterior part of the upper lobe at the level of the arch of the aorta. It was easily removed through a small incision in the lobe. The lung was expanded by the anesthetist and the hole sutured with plain No. 0 catgut. There was

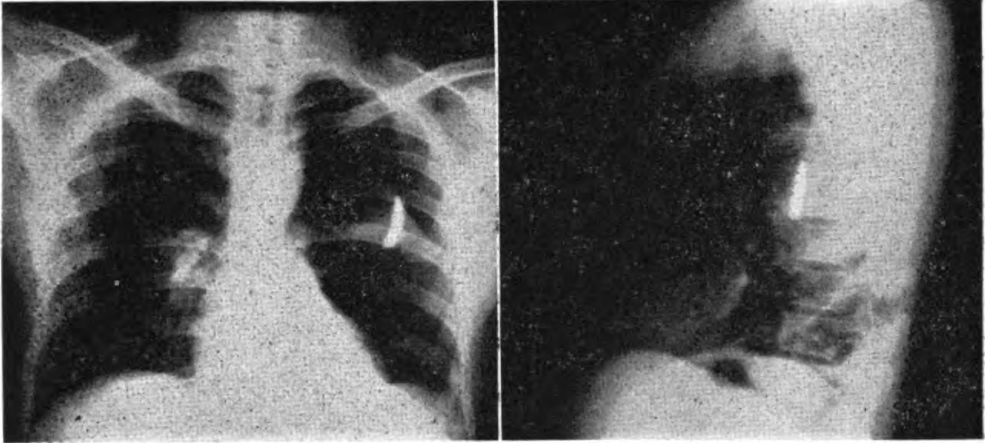


FIGURE 1. Anterior-posterior and lateral roentgenograms of chest on admission show the bullet in a vertical position in the mid-posterior chest. In the right-hand picture, note partial pneumothorax and drill-hole fracture just below the spine of the scapula.

no bleeding. After removal of the rib spreaders the thoracotomy opening was closed by drawing the third and fourth ribs close together and fixing them with an encircling ligature of heavy braided silk. The intercostal structures were united by a continuous suture of No. 1 chromic catgut. The rest of the wound was closed by interrupted sutures of fine silk closely placed. The lung was fully expanded during the closure and held so until it was completed. No drainage was employed. No sulfonamide was used.

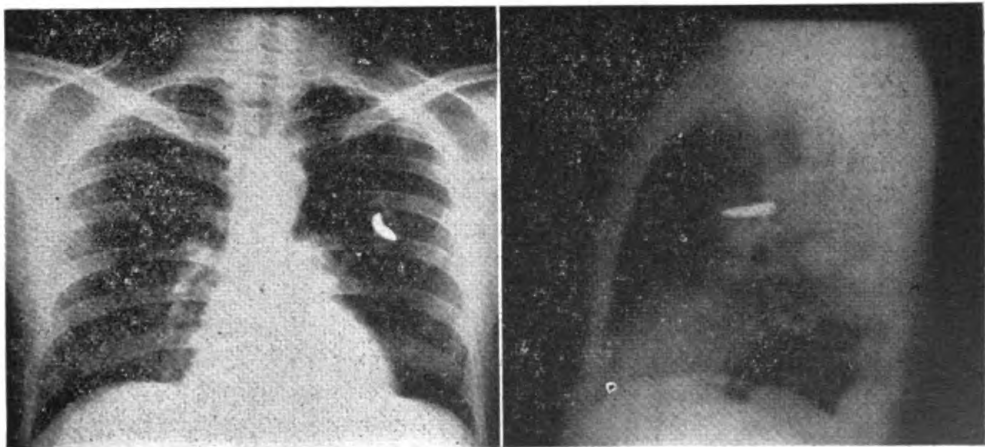


FIGURE 2. Repeat films show re-expansion of the lung with the bullet shifted forward and horizontal.

The postoperative course was uneventful except for some bleeding into the pleural space, probably from an unsecured intercostal vessel. This was treated by repeated aspiration. The soldier made a rapid recovery, and roentgenograms of the chest taken twenty days after the operation were normal.

Comment

Thoracic surgeons recognize a rather definite mortality expectancy associated with exploratory thoracotomy. With respect to the removal of metallic foreign bodies from the lung, the general feeling has been that the risk of open chest operation is probably greater than the morbidity expectancy if the patient is let alone.

The fact is, however, that our present conception of the risk involved in exploratory thoracotomy is based almost entirely on the results in patients having advanced pulmonary disease, and in situations where a rather formidable amount of manipulation and dissection is necessarily a part of the exploration. These circumstances must be a very real cause for much of the mortality we have come to accept as a risk with exploratory thoracotomy. It does not necessarily follow that the same risk exists in persons with metallic foreign bodies in the lung, but who are otherwise free of pulmonary disease.

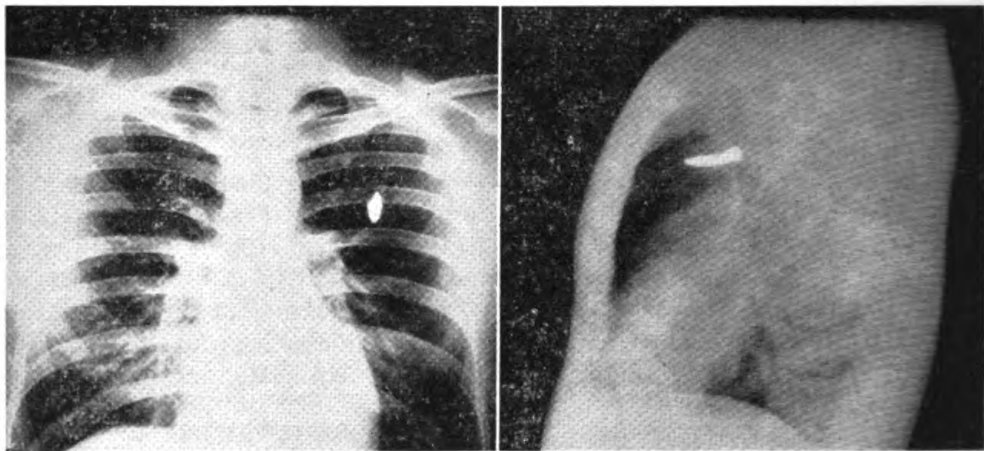


FIGURE 3. Repeat films show complete re-expansion of the lung with the bullet in the horizontal and near the anterior chest wall. This was the position at the time of operation.

Metallic foreign bodies should probably be removed from the lung if the operation appears safe and if it seems likely that future lung trouble will be caused by allowing them to remain. Such procedures are obviously not in the province of "front line" medical installations. It seems reasonable that, while conservatism is desirable as a general plan in dealing with such cases, it might be a mistake routinely to refuse operation to these patients on the basis of an uncertain dogma. Where the operation appears safe and a strong probability of future lung trouble exists, the cause of disability for the patient and the reason for future compensation claims against the Government can be eliminated by operation. What is equally important, a seasoned soldier can be returned to duty.

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